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FOR THE USE OF

COMMERCIAL HOUSES & THOSE INTERESTED IN SHIPS,

OPERATIVE MECHANICS,

ARTIFICERS AND ENGINEERS.

By I. R. BUTTS,

Author of the "Business Man's Assistant"; "Business Man's Law Library"; "United States Law Cabinet"; &c. &c.

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Calling the Diameters Feet the Areas are Feet,—then, if a Ship's Water Tank, Steam Boiler, &c., is 5⅛, or any number of Feet and parts of Feet in Diameter, find the Area in the Table which corresponds in Inches, multiply it by the length in Feet, and multiply this result by a Cubic Foot, (7.48), and the product is the answer in Gallons. . . . 224

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TONNAGE

OF

DOUBLE DECKED VESSELS.

EXAMPLE.

The length of a double decked vessel is 251 feet 7 inches, breadth 49 feet 9¾ inches, what is her register tonnage?

2) 49·8125 ft. wide.

24·90625 ft. deep.

49·8125 ft. wide.

3

5) 149.4375

29.8875

251·5833 ft. long.*

29·8875

221·6958

49·8125 ft. wide.

11084790

4433916

2216958

17735664

19952622

8867832

11043·22203750

24·90625 ft. deep.

5521611018750

2208644407500

6625933222500

9938899833750

4417288815000

2208644407500

95) 275045·2488714843750 (2895 tons $\frac{20}{95}$

190

850

760

904

855

495

475

20

* See Table of Decimals equivalent to the fractional parts of a Foot, p. 147.

TABLES

GIVING THE LENGTH, BREADTH AND TONNAGE OF 3048 DOUBLE DECKED VESSELS, OF 206 TO 2682 TONS.

Computed by GEORGE RAYNES, Esq., Shipbuilder, Portsmouth, N. H.

These Tables have been prepared with great care and expense, for COMMERCIAL HOUSES, *and those interested in* SHIPS; *and their accuracy may be confidently relied upon.*

Government Rule for finding the Tonnage of a Double Decked Vessel.

Take the length of every vessel, if double decked, from the fore part of the main stem to the afterside of the sternpost above the upper deck, the breadth at the broadest part above the main wales; and half such breadth shall be accounted the depth of every double decked vessel; then deduct from the length 3-5ths of the breadth; multiply the remainder by the breadth, and the product by the depth; divide this last product by 95, and the quotient is the true tonnage of such vessel.

EXAMPLE.— The length of a double decked vessel is 110 feet, breadth 20 feet, what is the tonnage?

$20 \div 2 = 10$ depth.

$110 - 3\text{-}5\text{ths}\ 20 = 98 \times 20 = 1960 \times 10 = 19600 \div 95 = 206{\cdot}30$ tons.

L designates length of Vessel in feet, B breadth, and T Tons and 95 ths.

L	*B*	*Tons.*	*L*	*B*	*Tons.*	*L*	*B*	*Tons.*	*L*	*B*	*Tons.*
110	20	206 30	110	26½	347 75	111	24¾	309 94	112	23	273 39
	20¼	211 17		26¾	353 78		25	315 75		23¼	278 91
	20½	216 9		27	359 85		25¼	321 60		23½	284 52
	20¾	221 5		27¼	366		25½	327 49		23¾	290 18
	21	226 6		27½	372 14		25¾	333 42		24	295 83
	21¼	231 12		27¾	378 32		26	339 40		24¼	301 58
	21½	236 22		28	384 54		26¼	345 41		24½	307 37
	21¾	241 36	111	20	208 40		26½	351 47		24¾	313 20
	22	246 55		20¼	213 32		26¾	357 56		25	319 7
	22¼	251 78		20½	218 29		27	363 69		25¼	324 93
	22½	257 11		20¾	223 31		27¼	369 86		25½	330 89
	22¾	262 43		21	228 37		27½	376 12		25¾	336 89
	23	267 79		21¼	233 48		27¾	382 37		26	342 93
	23¼	273 25		21½	238 63		28	388 66		26¼	349 6
	23½	278 70		21¾	243 83	112	20	210 50		26½	355 18
	23¾	284 24		22	249 12		20¼	215 47		26¾	361 34
	24	289 77		22¼	254 41		20½	220 49		27	367 54
	24¼	295 40		22½	259 74		20¾	225 56		27¼	373 78
	24½	301 6		22¾	265 17		21	230 67		27½	380 10
	24¾	306 72		23	270 59		21¼	235 83		27¾	386 42
	25	312 47		23¼	276 11		21½	241 9		28	392 78
	25¼	318 26		23½	281 61		21¾	246 34	113	20	212 60
	25½	324 9		23¾	287 21		22	251 64		20¼	217 62
	25¾	329 91		24	292 80		22¼	257 4		20½	222 69
	26	335 82		24¼	298 49		22½	262 42		20¾	227 81
	26¼	341 77		24½	304 22		22¾	267 86		21	233 3

Entered according to Act of Congress, in the year 1855, by I. R. BUTTS, in the Clerk's Office of the District Court of Massachusetts.

L designates length, B breadth.

L	B	Tons.	L	B	Tons.	L	B	Tons.	L	B	Tons.
113	21¼	238 24	114	25¾	343 87	116	22	261 82	117	26½	373 63
	21½	243 50		26	350 9		22½	267 44		26¾	380 18
	21¾	248 81		26¼	356 30		22½	273 10		27	386 71
	22	254 21		26½	362 55		22¾	278 76		27¼	393 34
	22¼	259 61		26¾	368 84		23	284 52		27½	400
	22½	265 10		27	375 23		23¼	290 32		27¾	406 67
	22¾	270 59		27¼	381 60		23½	296 17		28	413 43
	23	276 18		27½	388 7		23¾	302 06	118	20	223 15
	23¼	281 76		27¾	394 52		24	308		20½	228 42
	23½	287 43		28	401 7		24½	313 94		20½	233 75
	23¾	293 15	115	20	216 80		24½	320 2		20¾	239 17
	24	298 87		20¼	221 92		24¾	326 10		21	244 60
	24¼	304 67		20½	227 14		25	332 22		21¼	250 13
	24½	310 52		20¾	232 37		25¼	338 39		21½	255 66
	24¾	316 41		21	237 64		25½	344 60		21¾	261 28
	25	322 35		21¼	243 1		25¾	350 85		22	266 91
	25¼	328 32		21½	248 37		26	357 20		22¼	272 64
	25½	334 34		21¾	253 79		26¼	363 54		22½	278 41
	25¾	340 41		22	259 30		26½	369 92		22¾	284 23
	26	346 51		22¼	264 81		26¾	376 40		23	290 10
	26¼	352 65		22½	270 42		27	382 87		23¼	296 2
	26½	358 84		22¾	276 7		27¼	389 43		23½	301 94
	26¾	365 11		23	281 72		27½	396 3		23¾	308
	27	371 38		23¼	287 46		27¾	402 62		24	314 6
	27¼	377 69		23½	293 26		28	409 31		24¼	320 17
	27½	384 9		23¾	299 9	117	20	221 5		24½	326 33
	27¾	390 47		24	304 92		20¼	226 27		24¾	332 52
	28	396 90		24¼	310 85		20½	231 55		25	338 77
114	20	214 70		24½	316 82		20¾	236 87		25¼	345 11
	20¼	219 77		24¾	322 84		21	242 30		25½	351 45
	20½	224 89		25	328 90		21¼	247 72		25¾	357 83
	20¾	230 11		25¼	335 5		21½	253 25		26	364 31
	21	235 33		25½	341 20		21¾	258 77		26¼	370 78
	21¼	240 60		25¾	347 39		22	264 39		26½	377 34
	21½	245 90		26	353 62		22¼	290 6		26¾	383 90
	21¾	251 32		26¼	359 89		22½	275 73		27	390 56
	22	256 73		26½	366 26		22¾	281 50		27¼	397 25
	22¼	262 24		26¾	372 62		23	287 31		27½	403 94
	22½	267 74		27	379 7		23¼	293 17		27¾	410 73
	22¾	273 33		27¼	385 51		23½	299 8		28	417 55
	23	278 93		27½	392 5		23¾	303 3	119	20	225 25
	23¼	284 61		27¾	398 57		24	311 3		20¼	230 57
	23½	290 34		28	405 19		24¼	317 8		20½	236
	23¾	296 12	116	20	218 90		24½	323 17		20¾	241 43
	24	301 89		20¼	224 12		24¾	329 31		21	246 91
	24¼	307 76		20½	229 34		25	335 50		21¼	252 49
	24½	313 67		20¾	234 62		25¼	341 72		21½	258 12
	24¾	319 62		21	239 94		25½	348 5		21¾	263 75
	25	325 62		21¼	245 37		25¾	354 36		22	269 48
	25¼	331 66		21½	250 79		26	360 73		22¼	275 26
	25½	337 75		21¾	256 30		26¼	367 18		22½	281 9

L designates length, B breadth.

L	B	Tons.	L	B	Tons.	L	B	Tons.	L	B	Tons.
119	22¾	286 92	120	28	425 79	122	25	351 92	123	30½	504 92
	23	292 85		28¼	432 80		25½	358 51		30⅝	512 58
	23¼	298 83		28⅜	439 85		25⅝	365 15		30¾	520 29
	23⅜	304 85		28¾	446 94		25¾	371 79		31	528 4
	23½	310 92		29	454 13		26	378 53	124	24	332 24
	24	317 9	121	22	274 57		26¼	385 31		24¼	338 71
	24¼	323 26		22¼	280 46		26½	392 14		24⅝	345 28
	24⅜	329 48		22⅜	286 41		26¾	399 1		24¾	351 85
	24½	335 74		22¾	292 40		27	405 89		25	358 52
	25	342 10		23	298 44		27¼	412 85		25¼	365 24
	25¼	348 45		23¼	304 53		27½	419 87		25⅝	372 1
	25⅜	354 85		23⅜	310 67		27¾	426 93		25¾	378 77
	25½	361 35		23¾	316 86		28	434 8		26	385 64
	26	367 84		24	323 15		28¼	441 23		26¼	392 55
	26¼	374 42		24¼	329 44		28⅜	448 42		26⅝	399 51
	26½	381 5		24⅜	335 78		28¾	455 66		26¾	406 52
	26¾	387 68		24¾	342 21		29	462 94		27	413 58
	27	394 40		25	348 65		29¼	470 31		27¼	420 68
	27½	401 17		25¼	355 17		29⅜	477 68		27⅝	427 83
	27⅜	407 92		25⅜	361 70		29¾	485 14		27⅞	435 8
	27¾	414 78		25¾	368 33		30	492 60		28	442 32
	28	421 67		26	375	123	23	304 3		28¼	449 61
120	21	249 26		26¼	381 66		23¼	310 24		28⅝	456 94
	21½	254 85		26½	388 43		23⅝	316 50		28¾	464 37
	21¼	260 53		26¾	395 24		23¾	323 80		29	471 80
	21¾	266 27		27	402 9		24	329 21		29¼	479 32
	22	272 5		27¼	408 94		24¼	335 62		29⅝	486 83
	22¼	277 84		27½	415 89		24⅝	342 13		29¾	494 44
	22½	283 72		27¾	422 88		24¾	348 64		30	502 10
	22¾	289 66		28	429 91		25	355 25		30¼	509 74
	23	295 65		28¼	437 4		25¼	361 85		30⅝	517 48
	23¼	301 68		28½	444 16		25½	368 56		30¾	525 27
	23½	307 76		28¾	451 33		25¾	371 31		31	533 9
	23¾	313 89		29	458 53		26	382 11		31¼	540 91
	24	320 12		29¼	465 78		26¼	388 91		31⅝	548 82
	24½	326 35		29⅝	473 13		26⅝	395 80		31¾	556 78
	24⅝	332 63		29¾	480 47		26¾	402 74		32	564 77
	24¾	339		30	487 85		27	409 73	125	25	361 80
	25	345 37	122	22	277 14		27¼	416 77		25¼	368 58
	25¼	351 79		22¼	283 9		27½	423 85		25½	375 41
	25⅜	358 30		22⅝	289 9		27¾	431 3		25¾	382 29
	25¾	364 81		22¾	295 13		28	438 20		26	389 22
	26	371 42		23	301 23		28¼	445 42		26¼	396 20
	26¼	378 7		23¼	307 38		28⅝	452 68		26⅝	403 22
	26⅜	384 72		23⅝	313 58		28¾	460 4		26¾	410 30
	26¾	391 46		23¾	319 83		29	467 39		27	417 42
	27	398 25		24	326 18		29¼	474 79		27¼	424 59
	27½	405 8		24¼	332 53		29½	482 28		27⅝	431 81
	27⅜	411 91		24⅝	338 93		29¾	489 77		27¾	439 13
	27¾	418 83		24¾	345 43		30	497 35		28	446 44

L designates length, B breadth.

L	B	Tons.	L	B	Tons.	L	B	Tons.	L	B	Tons.
125	28¼	453 80	126	33½	625 48	128	29½	505 19	129	33¾	651 91
	28½	461 25		33¾	633 92		29¾	513 9		34	660 70
	28¾	468 71		34	642 46		30	521 5	130	26	407 2
	29	476 25	127	26	396 33		30¼	529 4		26¼	414 32
	29¼	483 80		26¼	403 44		30½	537 9		26½	421 68
	29½	491 44		26½	410 59		30¾	545 18		26¾	429 14
	29¾	499 12		26¾	417 80		31	553 31		27	436 60
	30	506 80		27	425 11		31¼	561 49		27¼	444 16
	30¼	514 57		27¼	432 42		31½	569 72		27½	451 72
	30½	522 38		27½	439 77		31¾	578 4		27¾	459 38
	30¾	530 24		27¾	447 23		32	586 35		28	467 9
	31	538 15		28	454 68		32¼	594 71		28¼	474 80
	31¼	546 9		28¼	462 23		32½	603 16		28½	482 61
	31½	554 8		28½	469 78		32¾	611 61		28¾	490 41
	31¾	562 12		28¾	477 42		33	620 14		29	498 38
	32	570 19		29	485 11		33¼	628 68		29¼	506 34
	32¼	578 31		29¼	492 80		33½	637 30		29½	514 34
	32½	586 47		29½	500 59		33¾	645 91		29¾	522 39
	32¾	594 67		29¾	508 42		34	654 62		30	530 50
	33	602 91		30	516 30	129	26	403 44		30¼	538 64
126	26	392 75		30¼	524 22		26¼	410 68		30½	546 84
	26¼	399 79		30½	532 19		26½	418 2		30¾	555 13
	26½	406 88		30¾	540 20		26¾	425 36		31	563 42
	26¾	414 8		31	548 26		27	432 75		31¼	571 76
	27	421 27		31¼	556 36		27¼	440 24		31½	580 19
	27¼	428 50		31½	564 51		27½	447 74		31¾	588 62
	27½	435 79		31¾	572 70		27¾	455 33		32	597 14
	27¾	443 18		32	580 93		28	462 92		32¼	605 66
	28	450 56		32¼	589 26		28¼	470 61		32½	614 27
	28¼	458 4		32½	597 58		28½	478 35		32¾	622 88
	28½	465 52		32¾	605 94		28¾	486 14		33	631 58
	28¾	473 9		33	614 40		29	493 92		33¼	640 33
	29	480 66		33¼	622 85		29¼	501 81		33½	649 12
	29¼	488 32		33½	631 39		29½	509 74		33¾	657 91
	29½	496 4		33¾	639 92		29¾	517 72		34	666 78
	29¾	503 74		34	648 54		30	525 75	131	27	440 44
	30	511 55	128	26	399 86		30¼	533 82		27¼	448 7
	30¼	519 39		26¼	407 8		30½	541 94		27½	455 70
	30½	527 28		26½	414 31		30¾	550 16		27¾	463 43
	30¾	535 22		26¾	421 58		31	558 37		28	471 21
	31	543 20		27	428 91		31¼	566 63		28¼	479 04
	31¼	551 23		27¼	436 33		31½	574 93		28½	486 87
	31½	559 29		27½	443 75		31¾	583 33		28¾	494 80
	31¾	567 41		27¾	451 28		32	591 72		29	502 78
	32	575 56		28	458 80		32¼	600 21		29¼	510 81
	32¼	583 76		28¼	466 42		32½	608 69		29½	518 89
	32½	592 5		28½	474 9		32¾	617 27		29¾	527 7
	32¾	600 33		28¾	481 75		33	625 84		30	535 25
	33	608 65		29	489 52		33¼	634 50		30¼	543 47
	33¼	617 7		29¼	497 33		33½	643 21		30½	551 74

L designates length, B breadth.

L	B	Tons.	L	B	Tons.	L	B	Tons.	L	B	Tons.
131	30¾	560 11	132	35	715 62	134	31	583 64	136	28	491 81
	31	568 48	133	27	448 13		31¼	592 34		28¼	500 4
	31¼	576 89		27¼	455 85		31½	601 9		28½	508 28
	31½	585 40		27½	463 66		31⅝	609 83		28⅝	516 57
	31¾	593 91		27¾	471 53		32	618 61		29	524 91
	32	602 51		28	479 45		32¼	627 56		29¼	533 35
	32¼	611 16		28¼	487 42		32½	636 50		29½	541 80
	32½	619 81		28½	495 44		32⅝	645 48		29⅝	550 35
	32⅝	628 54		28⅝	503 52		33	654 51		30	558 90
	33	637 33		29	511 64		33⅓	663 59		30¼	567 55
	33¼	646 16		29¼	519 82		33½	672 72		30½	576 25
	33½	655 3		29½	528 9		33⅝	681 89		30⅝	585
	33¾	663 90		29⅝	536 37		34	691 15		31	593 75
	34	672 86		30	544 70		34¼	700 41		31¼	602 60
	34¼	681 87		30¼	553 12		34½	709 72		31½	611 51
	34½	690 92		30½	561 54		34⅝	719 12		31⅝	620 46
	34¾	700 6		30⅝	570 7		35	728 52		32	629 46
	35	709 20		31	578 59	135	27	455 77		32¼	638 51
132	27	444 29		31¼	587 21		27¼	463 67		32½	647 61
	27¼	451 93		31½	595 82		27½	471 62		32⅝	656 76
	27½	459 68		31⅝	604 54		27⅝	479 63		33	666
	27¾	467 48		32	613 30		28	487 69		33¼	675 25
	28	475 33		32¼	622 11		28¼	495 80		33½	684 54
	28¼	483 23		32½	630 92		28½	504 2		33¾	693 88
	28½	491 18		32⅝	639 82		28⅝	512 23		34	703 31
	28⅝	499 19		33	648 77		29	520 50		34¼	712 75
	29	507 24		33¼	657 77		29¼	528 82		34½	722 27
	29¼	515 34		33½	666 81		29½	537 25		34⅝	731 80
	29½	523 49		33⅝	675 89		29⅝	545 67		35	741 42
	29⅝	531 70		34	685 7		30	554 20		35¼	751 9
	30	540		34¼	694 25		30¼	562 72		35½	760 75
	30¼	548 30		34½	703 47		30½	571 35		35⅝	770 51
	30½	556 64		34⅝	712 74		30⅝	580 2		36	780 31
	30⅝	565 9		35	722 10		31	588 70	137	28	495 93
	31	573 53	134	27	451 93		31¼	597 47		28¼	504 23
	31¼	582 7		27¼	459 76		31½	606 30		28½	512 54
	31½	590 61		27½	467 64		31⅝	615 17		28⅝	520 90
	31⅝	599 25		27⅝	475 58		32	624 09		29	529 36
	32	607 88		28	483 57		32¼	633 06		29¼	537 83
	32¼	616 61		28¼	491 61		32½	642		29½	546 40
	32½	625 39		28½	499 71		32⅝	651 15		29⅝	555 2
	32⅝	634 21		28⅝	507 85		33	660 26		30	563 65
	33	643 7		29	516 10		33¼	669 42		30¼	572 37
	33¼	651 94		29¼	524 35		33½	678 63		30½	581 15
	33½	660 90		29½	532 65		33⅝	687 88		30⅝	589 93
	33⅝	669 90		29⅝	541 5		34	697 23		31	598 81
	34	678 94		30	549 45		34¼	706 58		31¼	607 74
	34¼	688 8		30¼	557 89		34½	716 02		31½	616 72
	34½	697 22		30½	566 44		34⅝	725 46		31⅝	625 75
	34⅝	706 40		30¾	575 4		35	735		32	634 83

L designates length, B breadth.

L	B	Tons.	L	B	Tons.	L	B	Tons.	L	B	Tons.
137	32¼	644 1	139	28¼	512 61	140	32½	669 84	142	28½	533 90
	32½	653 19		28½	521 11		32¾	679 36		28¾	542 66
	32¾	662 42		28¾	529 61		33	688 88		29	551 49
	33	671 70		29	538 22		33¼	698 51		29¼	560 37
	33¼	681 8		29¼	546 84		33½	708 18		29½	569 31
	33½	690 45		29½	555 55		33¾	717 86		29¾	578 30
	33¾	699 87		29¾	564 32		34	727 63		30	587 35
	34	709 39		30	573 15		34¼	737 46		30¼	596 45
	34¼	718 91		30¼	582 2		34½	747 33		30½	605 61
	34½	728 53		30½	590 90		34¾	757 25		30¾	614 82
	34¾	738 19		30¾	599 88		35	767 22		31	624 13
	35	747 85		31	608 92		35¼	777 24		31¼	633 45
	35¼	757 60		31¼	618 5		35½	787 30		31½	642 82
	35½	767 40		31½	627 19		35¾	797 42		31¾	652 30
	35¾	777 25		31¾	636 86		36	807 58		32	661 78
	36	787 14		32	645 62	141	28	512 46		32¼	671 36
138	28	500 10		32¼	654 91		28¼	521 4		32½	681
	28¼	508 42		32½	664 30		28½	529 63		32¾	690 64
	28½	516 80		32¾	673 70		28¾	538 33		33	700 37
	28¾	525 28		33	683 19		29	547 8		33¼	710 16
	29	533 77		33¼	692 68		29¼	555 84		33½	720 1
	29¼	542 36		33½	702 27		29½	564 70		33¾	729 85
	29½	551		33¾	711 86		29¾	573 62		34	739 79
	29¾	559 65		34	721 55		30	582 60		34¼	749 79
	30	568 40		34¼	731 29		30¼	591 62		34½	759 83
	30¼	577 20		34½	741 8		30½	600 70		34¾	769 93
	30½	586 5		34¾	750 86		30¾	609 84		35	780 12
	30¾	594 90		35	760 75		31	619 8		35¼	790 31
	31	603 86		35¼	770 67		31¼	628 32		35½	800 56
	31¼	612 87		35½	780 65		31½	637 61		35¾	810 85
	31½	621 93		35¾	790 68		31¾	647 1		36	821 24
	31¾	631 9		36	800 75		32	656 41	143	28	520 70
	32	640 25	140	28	508 34		32¼	665 86		28¼	529 43
	32¼	649 46		28¼	516 80		32½	675 42		28½	538 21
	32½	658 72		28½	525 37		32¾	685 2		28¾	547 5
	32¾	668 8		28¾	534		33	694 63		29	555 89
	33	677 44		29	542 63		33¼	704 34		29¼	564 85
	33¼	686 85		29¼	551 36		33½	714 10		29½	573 86
	33½	696 36		29½	560 15		33¾	723 86		29¾	582 92
	33¾	705 87		29¾	569		34	733 71		30	592 10
	34	715 47		30	577 85		34¼	743 62		30¼	601 27
	34¼	725 13		30¼	586 80		34½	753 58		30½	610 51
	34½	734 78		30½	595 80		34¾	763 59		30¾	619 80
	34¾	744 52		30¾	604 86		35	773 65		31	629 19
	35	754 32		31	614 2		35¼	783 75		31¼	638 59
	35¼	764 16		31¼	623 19		35½	793 90		31½	648 9
	35½	774 5		31½	632 40		35¾	804 16		31¾	657 59
	35¾	783 94		31¾	641 67		36	814 41		32	667 20
	36	793 92		32	651 4	142	28	516 58		32¼	676 81
139	28	504 22		32¼	660 41		28¼	525 23		32½	686 53

L designates length, B breadth.

L	B	Tons.	L	B	Tons.	L	B	Tons.	L	B	Tons.
143	32¾	696 30	145	28¾	555 71	146	33	723 31	148	29	578 7
	33	706 12		29	564 75		33¼	733 43		29¼	587 39
	33¼	715 94		29¼	573 85		33½	743 60		29½	596 76
	33⅝	725 87		29⅓	583 6		33¾	753 83		29¾	606 25
	33⅔	735 84		29⅔	592 27		34	764 16		30	615 75
	34	745 87		30	601 55		34¼	774 50		30¼	625 35
	34¼	756		30¼	610 87		34⅛	784 89		30⅙	635 1
	34½	766 13		30½	620 31		34⅜	795 38		30⅝	644 68
	34⅝	776 31		30¾	629 75		35	805 87		31	654 46
	35	786 55		31	639 30		35¼	816 46		31¼	664 30
	35¼	796 83		31¼	648 85		35½	827 11		31⅓	674 19
	35½	807 21		31½	658 51		35¾	837 76		31⅔	684 14
	35¾	817 59		31¾	668 22		36	848 51		32	694 15
	36	828 7		32	677 94	147	28	537 23		32¼	704 22
144	28	524 82		32¼	687 76		28¼	546 24		32½	714 34
	28¼	533 61		32⅙	697 64		28⅙	555 30		32¾	724 51
	28½	542 47		32⅝	707 57		28⅝	564 43		33	734 74
	28¾	551 38		33	717 56		29	573 61		33¼	745 8
	29	560 35		33¼	727 60		29¼	582 86		33⅙	755 42
	29¼	569 37		33½	737 69		29½	592 21		33¾	765 82
	29⅙	578 46		33¾	747 84		29¾	601 57		34	776 32
	29⅝	587 60		34	758 8		30	611 5		34¼	786 83
	30	596 80		34¼	768 33		30¼	620 52		34⅙	797 44
	30¼	606 10		34⅙	778 64		30⅙	630 11		34⅝	808 10
	30½	615 41		34¾	789 4		30⅝	639 71		35	818 77
	30¾	624 77		35	799 45		31	649 41		35¼	829 54
	31	634 24		35¼	809 90		31¼	659 17		35⅙	840 36
	31¼	643 72		35⅙	820 46		31⅙	668 93		35⅝	851 24
	31½	653 30		35⅝	831 7		31⅝	678 80		36	862 17
	31¾	662 88		36	841 68		32	688 73	149	28	545 47
	32	672 57	146	28	533 11		32¼	698 71		28¼	554 62
	32¼	682 31		28¼	542 5		32½	708 75		28½	563 82
	32½	692 11		28⅙	551 4		32¾	718 85		28¾	573 14
	32¾	701 91		28⅝	560 10		33	729 5		29	582 47
	33	711 81		29	569 21		33¼	739 29		29¼	591 86
	33¼	721 77		29¼	578 38		33½	749 51		29½	601 36
	33½	731 78		29½	587 61		33¾	759 83		29¾	610 87
	33¾	741 84		29¾	596 90		34	770 24		30	620 50
	34	752		30	606 30		34¼	780 66		30¼	630 17
	34¼	762 17		30¼	615 70		34⅙	791 19		30⅙	639 86
	34⅙	772 38		30½	625 21		34⅝	801 72		30⅝	649 66
	34⅝	782 65		30¾	634 73		35	812 35		31	659 52
	35	792 2		31	644 35		35¼	823 3		31¼	669 43
	35¼	803 39		31¼	654 3		35½	833 71		31⅙	679 40
	35⅙	813 81		31⅙	663 72		35¾	844 50		31⅝	689 43
	35⅝	824 33		31⅝	673 51		36	855 34		32	699 52
	36	834 85		32	683 36	148	28	541 35		32¼	709 67
145	28	528 94		32¼	693 26		28¼	550 43		32½	719 87
	28¼	537 81		32⅓	703 22		28⅙	559 56		32¾	730 17
	28½	546 73		32¾	713 24		28¾	568 76		33	740 49

L designates length, B breadth.

L	B	Tons.	L	B	Tons.	L	B	Tons.	L	B	Tons.
149	33¼	750 86	151	30½	639 78	152	34½	822 49	154	30½	664 37
	33½	761 34		30⅝	649 67		34¾	833 50		30¾	674 55
	33¾	771 82		30¾	659 62		35	844 57		31	684 79
	34	782 40		31	669 63		35¼	855 69		31¼	695 15
	34¼	794 4		31¼	679 70		35½	866 87		31½	705 51
	34½	803 69		31½	689 83		35¾	878 15		31¾	715 94
	34¾	814 44		31¾	700 6		36	889 44		32	726 47
	35	825 25		32	710 31		36¼	900 78		32¼	737 7
	35¼	836 10		32¼	720 62		36½	912 22		32½	747 67
	35½	847 1		32½	731 3		36¾	923 67		32⅝	758 39
	35¾	857 93		32¾	741 45		37	935 23		33	769 16
	36	869		33	751 93	153	29	600 19		33¼	780
150	28	549 59		33¼	762 51		29¼	609 87		33½	790 84
	28¼	558 81		33½	773 16		29½	619 67		33⅝	801 79
	28½	568 14		33¾	783 81		29¾	629 53		34	812 80
	28¾	577 48		34	794 56		30	639 45		34¼	823 87
	29	586 88		34¼	805 38		30¼	649 43		34½	835 5
	29¼	596 39		34½	816 24		30½	659 47		34¾	846 23
	29½	605 92		34⅝	827 17		30¾	669 57		35	857 47
	29¾	615 55		35	838 15		31	679 74		35¼	868 77
	30	625 25		35¼	849 18		31¼	690 1		35½	880 17
	30¼	635		35½	860 27		31½	700 30		35⅝	891 58
	30½	644 76		35¾	871 41		31¾	710 64		36	903 10
	30¾	654 64		36	882 61		32	721 10		36¼	914 62
	31	664 57		36¼	893 86		32¼	731 57		36½	926 25
	31¼	674 56		36½	905 21		32½	742 14		36¾	937 88
	31½	684 61		36⅝	916 57		32⅝	752 73		37	949 62
	31¾	694 72		37	928 3		33	763 42	155	29	609 5
	32	704 89	152	29	595 74		33¼	774 17		29¼	618 88
	32¼	715 17		29¼	605 40		33½	784 93		29½	628 82
	32½	725 45		29½	615 12		33¾	795 80		29¾	638 83
	32¾	735 79		29⅝	624 85		34	806 72		30	648 90
	33	746 23		30	634 70		34¼	817 71		30¼	659 8
	33¼	756 69		30¼	644 60		34½	828 75		30½	669 27
	33½	767 25		30½	654 57		34¾	839 84		30¾	679 53
	33¾	777 81		30¾	664 59		35	851 5		31	689 85
	34	788 48		31	674 68		35¼	862 25		31¼	700 28
	34¼	799 21		31¼	684 83		35½	873 52		31½	710 72
	34½	809 94		31½	695 9		35¾	884 84		31¾	721 28
	34¾	820 78		31⅝	705 35		36	896 27		32	731 84
	35	831 67		32	715 68		36¼	907 70		32¼	742 52
	35¼	842 62		32¼	726 12		36½	919 23		32½	753 25
	35½	853 62		32½	736 56		36¾	930 78		32¾	764 5
	35¾	864 67		32⅝	747 11		37	942 48		33	774 86
	36	875 78		33	757 67	154	29	604 60		33¼	785 78
151	29	591 33		33¼	768 34		29¼	614 40		33½	796 75
	29¼	600 87		33½	779 7		29½	624 27		33¾	807 79
	29½	610 52		33¾	789 80		29¾	634 20		34	818 88
	29¾	620 23		34	800 64		30	644 20		34¼	830 9
	30	630		34¼	811 54		30¼	654 25		34½	841 30

L designates length, B breadth.

L	B	Tons.	L	B	Tons.	L	B	Tons.	L	B	Tons.
155	34¾	852 57	157	30¾	689 48	158	35	883 27	160	31	715 17
	35	863 90		31	700 1		35¼	894 92		31¼	725 94
	35¼	875 33		31¼	710 54		35½	906 68		31½	736 83
	35½	886 77		31½	721 19		35¾	918 49		31¾	747 78
	35¾	898 32		31¾	731 86		36	930 37		32	758 79
	36	909 88		32	742 63		36¼	942 30		32¼	769 87
	36¼	921 54		32¼	753 47		36½	954 29		32½	781 6
	36½	933 26		32½	764 37		36¾	966 34		32¾	792 27
	36¾	945 3		32¾	775 33		37	978 45		33	803 53
	37	956 81		33	786 35	159	29	626 72		33¼	814 87
156	29	613 46		33¼	797 43		29¼	636 89		33½	826 31
	29¼	623 41		33½	808 58		29½	647 18		33¾	837 76
	29½	633 42		33¾	819 78		29¾	657 48		34	844 33
	29¾	643 50		34	831 9		30	667 85		34¼	860 91
	30	653 65		34¼	842 42		30¼	678 33		34½	872 60
	30¼	663 85		34½	853 80		30½	688 83		34¾	884 36
	30½	674 17		34¾	865 29		30¾	699 44		35	896 17
	30¾	684 51		35	876 80		31	710 12		35¼	908 4
	31	694 90		35¼	888 41		31¼	720 81		35½	919 93
	31¼	705 41		35½	900 7		31½	731 62		35¾	931 92
	31½	715 93		35¾	911 75		31¾	742 49		36	944 3
	31¾	726 57		36	923 54		32	753 42		36¼	956 14
	32	737 26		36¼	935 38		32¼	764 42		36½	968 31
	32¼	748 2		36½	947 28		32½	775 48		36¾	980 85
	32½	758 79		36¾	959 24		32¾	786 60		37	992 84
	32¾	769 66		37	971 25		33	797 79	161	30	677 35
	33	780 60	158	29	622 32		33¼	809 9		30¼	687 93
	33¼	791 60		29¼	632 41		33½	820 40		30½	698 63
	33½	802 66		29½	642 58		33¾	831 77		30¾	709 39
	33¾	813 78		29¾	652 80		34	843 25		31	720 23
	34	825 1		30	663 15		34¼	854 75		31¼	731 13
	34¼	836 25		30¼	673 50		34½	866 35		31½	742 9
	34½	847 55		30½	683 92		34¾	878 2		31¾	753 12
	34¾	858 91		30¾	694 46		35	889 70		32	764 21
	35	870 37		31	705 6		35¼	901 48		32¼	775 37
	35¼	881 84		31¼	715 68		35½	913 33		32½	786 59
	35½	893 42		31½	726 40		35¾	925 23		32¾	797 88
	35¾	905 6		31¾	737 20		36	937 20		33	809 28
	36	916 71		32	748 5		36¼	949 22		33¼	820 69
	36¼	928 46		32¼	758 92		36½	961 30		33½	832 22
	36½	940 27		32½	769 90		36¾	973 44		33¾	843 76
	36¾	952 13		32¾	780 94		37	985 64		34	855 41
	37	964 6		33	792 9	160	29	631 18		34¼	867 13
157	29	617 86		33¼	803 26		29¼	641 42		34½	878 86
	29¼	627 89		33½	814 49		29½	651 73		34¾	890 69
	29½	638 2		33¾	825 77		29¾	662 15		35	902 60
	29¾	648 18		34	837 17		30	672 60		35¼	914 56
	30	658 40		34¼	848 58		30¼	683 15		35½	926 58
	30¼	668 68		34½	860 10		30½	693 73		35¾	938 66
	30½	679 7		34¾	871 63		30¾	704 42		36	950 81

L designates length, B breadth.

L	B	Tons.	L	B	Tons.	L	B	Tons	L	B	Tons.
161	36½	963 6	163	32½	786 32	164	36½	996 36	166	33½	861 73
	36½	975 32		32⅝	797 70		36¾	1009 1		33¾	873 74
	36¾	987 65		32¾	809 20		37	1021 67		34	885 81
	37	1000 8		33	820 72		37¼	1034 44		34⅛	898
	37¼	1012 52		33⅛	832 35		37⅖	1047 27		34⅖	910 21
	37½	1025 7		33½	844 4		37¾	1060 16		34⅝	922 48
	37¾	1037 63		33⅝	855 75		38	1073 11		35	934 82
	38	1050 30		34	867 57	165	30	696 30		35¼	947 27
162	30	682 10		34⅛	879 46		30¼	707 23		35⅖	959 74
	30½	692 75		34⅖	891 41		30⅖	718 23		35⅝	972 31
	30½	703 53		34⅝	903 42		30¾	729 31		36	984 91
	30¾	714 37		35	915 50		31	740 55		36¼	997 61
	31	725 28		35⅛	927 63		31¼	751 66		36⅖	1010 38
	31¼	736 26		35⅖	939 83		31⅖	762 93		36¾	1023 21
	31½	747 30		35⅝	952 14		31¾	774 33		37	1036 11
	31¾	758 41		36	964 47		32	785 74		37⅛	1049 6
	32	769 58		36⅛	976 85		32⅛	797 27		37⅖	1062 8
	32⅛	780 82		36½	989 35		32⅖	808 82		37⅝	1075 16
	32⅖	792 17		36⅝	1001 85		32¾	820 48		38	1088 30
	32¾	803 54		37	1014 47		33	832 21		38⅛	1101 50
	33	815 2		37⅛	1027 15		33⅛	844		38⅖	1114 76
	33⅛	826 52		37⅖	1039 84		33⅖	855 82		38⅝	1128 14
	33½	838 13		37⅝	1052 63		33¾	867 74		39	1141 52
	33¾	849 76		38	1065 49		34	879 73	167	31	750 56
	34	861 49	164	30	691 55		34⅛	891 79		31⅛	761 92
	34⅛	873 29		30⅛	702 40		34⅖	903 91		31⅖	773 41
	34½	885 16		30½	713 33		34⅝	916 15		31⅝	784 91
	34⅝	897 8		30¾	724 33		35	928 40		32	796 53
	35	909 7		31	735 39		35⅛	940 71		32⅛	808 22
	35⅛	921 12		31⅛	746 52		35⅖	953 13		32⅖	819 93
	35½	933 23		31½	757 72		35¾	965 57		32¾	831 76
	35¾	945 40		31⅝	769 4		36	978 13		33	843 65
	36	957 64		32	780 37		36⅛	990 69		33⅛	855 61
	36⅛	969 93		32⅛	791 77		36½	1003 37		33½	867 64
	36½	982 34		32½	803 29		36¾	1016 11		33¾	879 73
	36¾	994 75		32⅝	814 82		37	1028 86		34	891 89
	37	1007 28		33	826 46		37⅛	1041 72		34⅛	904 17
	37¼	1019 81		33⅛	838 18		37⅖	1054 65		34⅖	916 46
	37½	1032 45		33½	849 90		37¾	1067 63		34⅝	928 82
	37¾	1045 16		33¾	861 75		38	1080 68		35	941 30
	38	1057 87		34	873 65	166	31	745 50		35⅛	953 78
163	30	686 80		34⅛	885 62		31⅛	756 79		35⅖	966 39
	30¼	697 68		34⅖	897 66		31⅖	768 19		35¾	979 5
	30½	708 43		34¾	909 76		31¾	779 62		36	991 74
	30¾	719 35		35	921 92		32	791 16		36⅛	1004 53
	31	730 34		35⅛	934 20		32⅛	802 72		36½	1017 39
	31¼	741 39		35½	946 48		32⅖	814 40		36¾	1030 32
	31½	752 51		35⅝	958 83		32¾	826 14		37	1043 30
	31¾	763 70		36	971 30		33	837 90		37⅛	1056 35
	32	775		36⅛	983 77		33⅛	849 78		37½	1069 46

L designates length, B breadth.

L	B	Tons.	L	B	Tons.	L	B	Tons.	L	B	Tons.
167	37¾	1082 63	169	33¾	891 72	170	38	1118 68	172	35	973 52
	38	1095 87		34	904 10		38¼	1132 31		35¼	986 50
	38½	1109 22		34¼	916 50		38½	1146 1		35½	999 54
	38½	1122 57		34½	929 2		38¾	1159 72		35¾	1012 66
	38¾	1136 4		34¾	941 55		39	1173 54		36	1025 84
	39	1149 52		35	954 20	171	32	818 11		36¼	1039 13
168	31	755 61		35¼	966 86		32¼	830 12		36½	1052 45
	31¼	767 10		35½	979 64		32½	842 20		36¾	1065 83
	31½	778 62		35¾	992 49		32¾	854 36		37	1079 33
	31¾	790 25		36	1005 40		33	866 58		37¼	1092 84
	32	801 90		36¼	1018 37		33¼	878 87		37½	1106 47
	32¼	813 67		36½	1031 41		33½	891 28		37¾	1120 16
	32½	825 51		36¾	1044 52		33¾	903 71		38	1133 87
	32¾	837 42		37	1057 69		34	916 26		38¼	1147 69
	33	849 39		37¼	1070 93		34¼	928 83		38½	1161 58
	33¼	861 44		37½	1084 27		34½	941 52		38¾	1175 53
	33½	873 55		37¾	1097 63		34¾	954 27		39	1189 55
	33¾	885 73		38	1111 11		35	967 10		39¼	1203 63
	34	898 2		38¼	1124 60		35¼	979 93		39½	1217 77
	34¼	910 34		38½	1138 20		35½	992 89		39¾	1232 3
	34½	922 71		38¾	1151 81		35¾	1005 92		40	1246 30
	34¾	935 21		39	1165 53		36	1019 6	173	32	828 85
	35	947 72	170	31	765 72		36¼	1032 21		32¼	841 7
	35¼	960 35		31¼	777 37		36½	1045 44		32½	853 32
	35½	973 4		31½	789 9		36¾	1058 73		32¾	865 63
	35¾	985 75		31¾	800 83		37	1072 13		33	878 7
	36	998 57		32	812 69		37¼	1085 55		33¼	890 53
	36¼	1011 45		32¼	824 62		37½	1099 9		33½	903 11
	36½	1024 40		32½	836 62		37¾	1112 64		33¾	915 17
	36¾	1037 42		32¾	848 69		38	1126 30		34	928 42
	37	1050 50		33	860 83		38¼	1140 3		34¼	941 21
	37¼	1063 64		33¼	873 9		38½	1153 77		34½	954 7
	37½	1076 84		33½	885 37		38¾	1167 62		34¾	967
	37¾	1090 16		33¾	897 72		39	1181 54		35	980
	38	1103 49		34	910 18		39¼	1195 52		35¼	993 6
	38¼	1116 88		34¼	922 67		39½	1209 57		35½	1006 19
	38½	1130 39		34½	935 27		39¾	1223 68		35¾	1019 40
	38¾	1143 90		34¾	947 88		40	1237 85		36	1032 67
	39	1157 53		35	960 62	172	32	823 48		36¼	1046 5
169	31	760 67		35¼	973 42		32¼	835 57		36½	1059 46
	31¼	772 24		35½	986 29		32½	847 74		36¾	1072 93
	31½	783 83		35¾	999 23		32¾	860 2		37	1086 52
	31¾	795 54		36	1012 23		33	872 32		37¼	1100 18
	32	807 32		36¼	1025 29		33¼	884 70		37½	1113 85
	32¼	819 17		36½	1038 43		33½	897 19		37¾	1127 64
	32½	831 9		36¾	1051 62		33¾	909 71		38	1141 49
	32¾	843 8		37	1064 89		34	922 34		38¼	1155 41
	33	855 14		37¼	1078 26		34¼	935 5		38½	1169 39
	33¼	867 27		37½	1091 65		34½	947 77		38¾	1183 44
	33½	879 46		37¾	1105 16		34¾	960 61		39	1197 55

L designates length, B breadth.

L	B	Tons.	L	B	Tons.	L	B	Tons.	L	B	Tons.
173	39¼	1211 73	175	35¼	1006 14	176	39½	1250 63	178	35½	1039 35
	39½	1226 2		35½	1019 45		39¾	1265 28		35¾	1053 5
	39¾	1240 33		35¾	1032 83		40	1280		36	1066 77
	40	1254 70		36	1046 33	177	32	850 43		36¼	1080 61
174	32	834 27		36¼	1059 85		32¼	862 92		36½	1094 52
	32¼	846 52		36½	1073 48		32½	875 54		36¾	1108 50
	32½	858 85		36¾	1087 19		32¾	888 23		37	1122 55
	32¾	871 30		37	1100 91		33	901		37¼	1136 67
	33	883 76		37¼	1114 75		33¼	913 79		37½	1150 85
	33¼	896 35		37½	1128 66		33½	926 70		37¾	1165 16
	33½	909 2		37¾	1142 64		33¾	939 69		38	1179 49
	33¾	921 70		38	1156 68		34	952 74		38¼	1193 88
	34	934 50		38¼	1170 79		34¼	965 87		38½	1208 40
	34¼	947 38		38½	1185 1		34½	979 13		38¾	1222 93
	34½	960 32		38¾	1199 26		34¾	992 40		39	1237 58
	34¾	973 34		39	1213 56		35	1005 75		39¼	1252 30
	35	986 42		39¼	1227 94		35¼	1019 21		39½	1267 8
	35¼	999 57		39½	1242 42		35½	1032 69		39¾	1281 88
	35½	1012 80		39¾	1256 93		35¾	1046 31		40	1296 80
	35¾	1026 14		40	1271 55		36	1059 94	179	32	861 22
	36	1039 50	176	32	845 6		36¼	1073 69		32¼	873 87
	36¼	1052 93		32¼	857 47		36½	1087 50		32½	886 65
	36½	1066 47		32½	870 1		36¾	1101 39		32¾	899 51
	36¾	1080 82		32¾	882 57		37	1115 35		33	912 44
	37	1093 72		33	895 25		37¼	1129 38		33¼	925 44
	37¼	1107 46		33¼	908 1		37½	1143 48		33½	938 52
	37½	1121 28		33½	920 79		37¾	1157 64		33¾	951 68
	37¾	1135 16		33¾	933 69		38	1171 87		34	964 90
	38	1149 11		34	946 66		38¼	1186 22		34¼	978 25
	38¼	1163 12		34¼	959 71		38½	1200 59		34½	991 63
	38½	1177 20		34½	972 82		38¾	1215 7		34¾	1005 13
	38¾	1191 35		34¾	986 6		39	1229 57		35	1018 65
	39	1205 56		35	999 32		39¼	1244 19		35¼	1032 29
	39¼	1219 83		35¼	1012 65		39½	1258 83		35½	1046
	39½	1234 22		35½	1026 10		39¾	1273 58		35¾	1059 74
	39¾	1248 63		35¾	1039 57		40	1288 40		36	1073 60
	40	1263 15		36	1053 16	178	32	855 80		36¼	1087 53
175	32	839 64		36¼	1066 77		32¼	868 43		36½	1101 53
	32¼	852 2		36½	1080 49		32½	881 12		36¾	1115 60
	32½	864 43		36¾	1094 29		32¾	893 85		37	1129 74
	32¾	876 91		37	1108 16		33	906 70		37¼	1144
	33	889 51		37¼	1122 9		33¼	919 62		37½	1158 29
	33¼	902 18		37½	1136 9		33½	932 61		37¾	1172 64
	33½	914 88		37¾	1150 16		33¾	945 68		38	1187 11
	33¾	927 69		38	1164 30		34	958 82		38¼	1201 60
	34	940 58		38¼	1178 50		34¼	972 9		38½	1216 21
	34¼	953 54		38½	1192 78		34½	985 38		38¾	1230 84
	34½	966 57		38¾	1207 16		34¾	998 74		39	1245 58
	34¾	979 67		39	1221 57		35	1012 22		39¼	1260 40
	35	992 85		39¼	1236 9		35¼	1025 73		39½	1275 28

L designates length, B breadth.

L	B	Tons.	L	B	Tons.	L	B	Tons.	L	B	Tons.
179	39¾	1290 23	181	36¾	1129 80	182	41	1392 54	184	37	1165 77
	40	1305 25		37	1144 18	183	33	935 37		37¼	1180 49
180	32	866 59		37¼	1158 58		33½	948 70		37½	1195 29
	32½	879 38		37½	1173 10		33½	962 17		37¾	1210 16
	32½	892 24		37¾	1187 64		33¾	975 66		38	1225 11
	32¾	905 17		38	1202 30		34	989 27		38¼	1240 13
	33	918 18		38¼	1217 3		34¼	1002 92		38½	1255 22
	33¼	931 27		38½	1231 78		34½	1016 68		38¾	1270 38
	33½	944 43		38¾	1246 65		34¾	1030 53		39	1285 61
	33¾	957 67		39	1261 59		35	1044 45		39¼	1300 91
	34	971 3		39¼	1276 60		35¼	1058 44		39½	1316 34
	34¼	984 42		39½	1291 68		35½	1072 51		39¾	1331 78
	34½	997 88		39¾	1306 83		35¾	1086 65		40	1347 35
	34¾	1011 46		40	1322 10		36	1100 87		40¼	1362 93
	35	1025 12		40¼	1337 38		36¼	1115 21		40½	1378 63
	35¼	1038 80		40½	1352 73		36½	1129 57		40¾	1394 41
	35½	1052 60		40¾	1368 20		36¾	1144 6		41	1410 25
	35¾	1066 48		41	1383 69		37	1158 57	185	33	946 81
	36	1080 43	182	33	929 62		37¼	1173 20		33¼	960 36
	36¼	1094 45		33¼	942 88		37½	1187 86		33½	973 94
	36½	1108 54		33½	956 26		37¾	1202 64		33¾	987 65
	36¾	1122 70		33¾	969 66		38	1217 49		34	1001 43
	37	1136 94		34	983 19		38¼	1232 41		34¼	1015 30
	37¼	1151 29		34¼	996 75		38½	1247 40		34½	1029 24
	37½	1165 67		34½	1010 43		38¾	1262 47		34¾	1043 25
	37¾	1180 16		34¾	1024 19		39	1277 60		35	1057 35
	38	1194 68		35	1038 2		39¼	1292 81		35¼	1071 51
	38¼	1209 31		35¼	1051 88		39½	1308 13		35½	1085 76
	38½	1224 2		35½	1065 86		39¾	1323 48		35¾	1100 13
	38¾	1238 74		35¾	1079 91		40	1338 90		36	1114 53
	39	1253 59		36	1094 9		40¼	1354 43		36¼	1129 5
	39¼	1268 50		36¼	1108 29		40½	1370 3		36½	1143 60
	39½	1283 48		36½	1122 56		40¾	1385 66		36¾	1158 27
	39¾	1298 53		36¾	1136 91		41	1401 40		37	1173 1
	40	1313 65		37	1151 38	184	33	941 11		37¼	1187 78
181	33	923 88		37¼	1165 87		33¼	954 53		37½	1202 67
	33¼	937 10		37½	1180 48		33½	968 8		37¾	1217 64
	33½	950 35		37¾	1195 16		33¾	981 65		38	1232 68
	33¾	963 67		38	1209 87		34	995 35		38¼	1247 79
	34	977 11		38¼	1224 70		34¼	1009 13		38½	1263 3
	34¼	990 58		38½	1239 59		34½	1022 93		38¾	1278 28
	34½	1004 18		38¾	1254 56		34¾	1036 86		39	1293 61
	34¾	1017 80		39	1269 60		35	1050 87		39¼	1309 7
	35	1031 55		39¼	1284 71		35¼	1065		39½	1324 54
	35¼	1045 36		39½	1299 88		35½	1079 16		39¾	1340 13
	35½	1059 25		39¾	1315 18		35¾	1093 39		40	1355 75
	35¾	1073 22		40	1330 50		36	1107 70		40¼	1371 48
	36	1087 26		40¼	1345 88		36¼	1122 13		40½	1387 29
	36¼	1101 37		40½	1361 38		36½	1136 58		40¾	1403 16
	36½	1115 55		40¾	1376 90		36¾	1151 16		41	1419 11

L designates length, B breadth.

L	B	Tons.	L	B	Tons.	L	B	Tons.	L	B	Tons.
186	34	1007 51	187	38½	1263 22	189	34½	1040 1	190	38½	1302 3
	34¼	1021 46		38½	1278 60		34½	1054 29		38¾	1317 77
	34½	1035 49		38¾	1294 10		34¾	1068 65		39	1333 64
	34¾	1049 59		39	1309 62		35	1083 15		39¼	1349 58
	35	1063 77		39¼	1325 27		35¼	1097 67		39½	1365 59
	35¼	1078 8		39½	1340 94		35½	1112 31		39¾	1381 68
	35½	1092 41		39¾	1356 73		35¾	1127 4		40	1397 85
	35¾	1106 82		40	1372 60		36	1141 80		40¼	1414 13
	36	1121 36		40¼	1388 53		36¼	1156 68		40½	1430 44
	36¼	1135 92		40½	1404 54		36½	1171 64		40¾	1446 83
	36½	1150 61		40¾	1420 62		36¾	1186 68		41	1463 33
	36¾	1165 37		41	1436 77		37	1201 79		41¼	1479 86
	37	1180 21		41¼	1453 4		37¼	1217 3		41½	1496 51
	37¼	1195 12		41½	1469 33		37½	1232 30		41¾	1513 24
	37½	1210 10		41¾	1485 69		37¾	1247 64		42	1530 3
	37¾	1225 16		42	1502 17		38	1263 11	191	35	1096 5
	38	1240 30	188	34	1019 67		38¼	1278 60		35¼	1110 74
	38¼	1255 51		34¼	1033 79		38½	1294 22		35½	1125 57
	38½	1270 79		34½	1048 4		38¾	1309 86		35¾	1140 47
	38¾	1286 19		34¾	1062 32		39	1325 63		36	1155 46
	39	1301 62		35	1076 67		39¼	1341 48		36¼	1170 52
	39¼	1317 17		35¼	1091 15		39½	1357 39		36½	1185 66
	39½	1332 73		35½	1105 66		39¾	1373 38		36¾	1200 88
	39¾	1348 43		35¾	1120 30		40	1389 45		37	1216 23
	40	1364 20		36	1135 2		40¼	1405 58		37¼	1231 61
	40¼	1380 3		36¼	1149 76		40½	1421 79		37½	1247 11
	40½	1395 89		36½	1164 63		40¾	1438 12		37¾	1262 64
	40¾	1411 86		36¾	1179 57		41	1454 48		38	1278 30
	41	1427 91		37	1194 60		41¼	1470 90		38¼	1294 3
	41¼	1444 8		37¼	1209 69		41½	1487 45		38½	1309 79
	41½	1460 27		37½	1224 87		41¾	1504 7		38¾	1325 68
	41¾	1476 52		37¾	1240 17		42	1520 71		39	1341 64
	42	1492 85		38	1255 49	190	34	1031 83		39¼	1357 68
187	34	1013 59		38¼	1270 89		34¼	1046 17		39½	1373 79
	34¼	1027 63		38½	1286 41		34½	1060 54		39¾	1390 3
	34½	1041 74		38¾	1302 1		34¾	1075 4		40	1406 30
	34¾	1055 93		39	1317 63		35	1089 57		40¼	1422 63
	35	1070 25		39¼	1333 37		35¼	1104 23		40½	1439 09
	35¼	1084 59		39½	1349 19		35½	1118 92		40¾	1455 58
	35½	1099 6		39¾	1365 8		35¾	1133 73		41	1472 19
	35¾	1113 56		40	1381 5		36	1148 63		41¼	1488 82
	36	1128 19		40¼	1397 8		36¼	1163 60		41½	1505 57
	36¼	1142 84		40½	1413 19		36½	1178 65		41¾	1522 40
	36½	1157 62		40¾	1429 37		36¾	1193 78		42	1539 30
	36¾	1172 47		41	1445 62		37	1209 4		42¼	1556 27
	37	1187 40		41¼	1462		37¼	1224 32		42½	1573 32
	37¼	1202 49		41½	1478 39		37½	1239 68		42¾	1590 43
	37½	1217 49		41¾	1494 86		37¾	1255 17		43	1607 62
	37¾	1232 64		42	1511 44		38	1270 68	192	35	1102 47
	38	1247 87	189	34	1025 75		38¼	1286 32		35¼	1117 30

L designates length, B breadth.

L	B	Tons.	L	B	Tons.	L	B	Tons.	L	B	Tons.
192	35½	1132 22	193	39¾	1406 63	195	36¾	1229 34	196	41	1516 41
	35¾	1147 21		40	1423 15		37	1245 6		41¼	1533 61
	36	1162 29		40¼	1439 68		37¼	1260 81		41½	1550 83
	36¼	1177 44		40½	1456 35		37½	1276 69		41¾	1568 28
	36½	1192 67		40¾	1473 8		37¾	1292 64		42	1585 70
	36¾	1208 4		41	1489 85		38	1308 68		42¼	1603 25
	37	1223 43		41¼	1506 73		38¼	1324 79		42½	1620 82
	37¼	1238 89		41½	1523 70		38½	1341 4		42¾	1638 52
	37½	1254 49		41¾	1540 73		38¾	1357 31		43	1656 29
	37¾	1270 17		42	1557 84		39	1373 66		43¼	1674 14
	38	1285 87		42¼	1575 7		39¼	1390 14		43½	1692 6
	38¼	1301 70		42½	1592 33		39½	1406 65		43¾	1710 6
	38½	1317 61		42¾	1609 66		39¾	1423 28		44	1728 12
	38¾	1333 59		43	1627 11		40	1440	197	36	1196 39
	39	1349 65	194	35	1115 37		40¼	1456 73		36¼	1212 4
	39¼	1365 78		35¼	1130 38		40½	1473 60		36½	1227 73
	39½	1382 5		35½	1145 47		40¾	1490 54		36¾	1243 55
	39¾	1398 33		35¾	1160 64		41	1507 56		37	1259 45
	40	1414 70		36	1175 90		41¼	1524 65		37¼	1275 43
	40¼	1431 18		36¼	1191 28		41½	1541 82		37½	1291 50
	40½	1447 69		36½	1206 70		41¾	1559 11		37¾	1307 64
	40¾	1464 33		36¾	1222 24		42	1576 43		38	1323 87
	41	1481 4		37	1237 82		42¼	1593 82		38¼	1340 23
	41¼	1497 78		37¼	1253 52		42½	1611 34		38½	1356 60
	41½	1514 63		37½	1269 30		42¾	1628 88		38¾	1373 13
	41¾	1531 57		37¾	1285 17		43	1646 55		39	1389 67
	42	1548 57		38	1301 11		43¼	1664 29		39¼	1406 35
	42¼	1565 65		38¼	1317 13		43½	1682 10		39½	1423 10
	42½	1582 80		38½	1333 23		43¾	1699 94		39¾	1439 88
	42¾	1607 7		38¾	1349 40		44	1717 89		40	1456 80
	43	1617 36		39	1365 66	196	36	1189 56		40¼	1473 78
193	35	1108 90		39¼	1382 4		36¼	1205 12		40½	1490 85
	35¼	1123 82		39½	1398 45		36½	1220 72		40¾	1508 5
	35½	1138 82		39¾	1414 93		36¾	1236 45		41	1525 27
	35¾	1153 90		40	1431 55		37	1252 26		41¼	1542 57
	36	1169 12		40¼	1448 23		37¼	1268 15		41½	1559 94
	36¼	1184 36		40½	1465		37½	1284 12		41¾	1577 44
	36½	1199 68		40¾	1481 79		37¾	1300 17		42	1595 2
	36¾	1215 14		41	1498 70		38	1316 30		42¼	1612 62
	37	1230 62		41¼	1515 69		38¼	1332 51		42½	1630 35
	37¼	1246 23		41½	1532 76		38½	1348 80		42¾	1648 16
	37½	1261 87		41¾	1549 90		38¾	1365 22		43	1666 4
	37¾	1277 64		42	1567 16		39	1381 67		43¼	1683 94
	38	1293 49		42¼	1584 45		39¼	1398 25		43½	1702 2
	38¼	1309 41		42½	1601 81		39½	1414 85		43¾	1720 13
	38½	1325 42		42¾	1619 30		39¾	1431 58		44	1738 30
	38¾	1341 50		43	1636 80		40	1448 40	198	36	1203 92
	39	1357 65	195	36	1182 73		40¼	1465 28		36¼	1218 91
	39¼	1373 89		36¼	1198 20		40½	1482 25		36½	1234 74
	39½	1390 25		36½	1213 71		40¾	1499 29		36¾	1250 65

L designates length, B breadth.

L	B	Tons.	L	B	Tons.	L	B	Tons.	L	B	Tons.
198	37	1266 65	199	37½	1306 31	200	42	1622 83	220	44	1972 64
	37¼	1282 72		37⅝	1322 64		43	1695 22		45	2056 92
	37½	1298 88		38	1339 11		44	1768 84	225	40	1692 60
	37⅝	1315 17		38¼	1355 61		45	1843 77		41	1773 1
	38	1331 49		38½	1372 23	205	37	1317 11		42	1854 93
	38¼	1347 89		38¾	1388 89		38	1384 68		43	1938 50
	38½	1364 42		39	1405 68		39	1453 71		44	2023 59
	38¾	1381 4		39¼	1422 55		40	1524 20		45	2110 45
	39	1397 68		39½	1439 50		41	1596 6	230	40	1734 70
	39⅓	1414 45		39¾	1456 53		42	1669 28		41	1817 23
	39½	1431 30		40	1473 65		43	1743 85		42	1901 38
	39¾	1448 23		40¼	1490 83		44	1819 79		43	1987 17
	40	1465 25		40½	1508 15		45	1897 10		44	2074 54
	40¼	1482 33		40¾	1525 50	210	40	1566 30		45	2163 52
	40½	1499 50		41	1542 93		41	1640 28	235	40	1776 80
	40¾	1516 75		41⅓	1560 48		42	1715 68		41	1861 46
	41	1534 12		41½	1578 11		43	1792 52		42	1947 78
	41¼	1551 52		41⅝	1595 77		44	1870 74		43	2035 80
	41½	1569 5		42	1613 56		45	1950 37		44	2125 49
	41⅝	1586 61		42¼	1631 42	215	38½	1497 06		45	2216 80
	42	1604 29		42½	1649 37		38¾	1515 37	245	40	1861 5
	42¼	1622 5		42⅝	1667 38		39	1533 76		41	1949 91
	42½	1639 84		43	1685 48		39¼	1552 30		42	2040 63
	42¾	1657 75		43¼	1703 65		39½	1570 87		43	2133 15
	43	1675 73		43½	1721 90		39¾	1589 59		44	2227 39
	43¼	1693 80		43⅝	1740 27		40	1608 40		45	2323 40
	43½	1711 93		44	1758 66		41	1684 51	250	40	1903 15
	43¾	1730 20	200	37	1281 9		42	1762 13		41	1994 18
	44	1748 48		37½	1313 69		43	1841 19		42	2087 8
199	36	1210 05		38	1346 68		44	1921 69		43	2181 77
	36½	1225 88		38½	1380 5		45	2003 70		44	2278 34
	36½	1241 78		39	1413 69	220	40	1650 50		45	2376 67
	36¾	1257 76		39½	1447 71		41	1728 73		46	2476 83
	37	1273 84		40	1482 10		42	1808 53		47	2578 71
	37¼	1290 6		41	1551 78		43	1889 82		48	2682 34

CARPENTER'S MEASUREMENT.

SINGLE DECKED VESSEL.

Multiply the length of keel, the breadth of beam, and the depth of the hold together, and divide by 95.

DOUBLE DECKED VESSEL.

Multiply, as is directed for single decked vessel, taking half the breadth of beam for the depth of the hold, and divide by 95.

TONNAGE

OF

SINGLE DECKED VESSELS.

EXAMPLES.

1. The length of a single decked vessel is 101 feet 9½ inches, breadth 26 feet 3 inches, depth 9 feet 2 inches, what is her register tonnage?

26·25 ft. wide.
3
5) 78·75
15·75

101·79166 ft. long. *
15·75
86·04166
26·25 ft. wide.
43020830
17208332
51624996
17208332
2258 5935750
9·1666 ft. deep.
135515614500
135515614500
135515614500
22585935750
203273421750
95) 20703·62386459500 (217 tons $\frac{88}{95}$
190
170
95
753
665
88

II. The length of a single decked vessel is 50 feet, breadth 16 feet, depth 6 feet, what is her register tonnage?

16 ft. wide.
3
5) 48
9·6

50 ft. long.
9·6
40·4
16 ft. wide.
2424
404
646·4
6 ft. deep.
95) 3878·4 (40 tons $\frac{78}{95}$.
380
78

* See Table of Decimals equivalent to the fractional parts of a Foot, p. 147.

TABLES

GIVING THE LENGTH, BREADTH, DEPTH, AND TONNAGE OF NEARLY 3000 SINGLE DECKED VESSELS, OF 40 TO 442 TONS.

[COMPUTED FOR THIS WORK.]

GOVERNMENT RULE TO FIND THE TONNAGE OF SINGLE DECKED VESSELS.

Take the length from the forepart of the main stem to the afterside of the sternpost above the upper deck, and the breadth at the broadest part above the main wales; and deduct from the length *three-fifths* of the breadth; take the depth from the under side of the deck-plank to the ceiling of the hold; multiply the remainder by the breadth, and that product by the depth; divide this last product by 95, and the quotient is the tonnage of such single decked vessel.

EXAMPLE.—The length of a vessel is 50 feet, the breadth 16 feet, and the depth of hold 6 feet; what is the tonnage?

50 — 3 5 ths of 16 = 40·4 × 16 = 646·4 × 6 = 3878·4 ÷ 95 = 40 tons 78-95ths.

L designates length, *B* breadth, *D* depth, and *T* tons and 95ths.

L	B	D	T	L	B	D	T	L	B	D	T	L	B	D	T
50	16	6	40.78	50	17	6¼	44.48	51	16½	6¾	48.17	52	16	7	49.93
		6¼	42.50			6½	46.27			7	49.91			7¼	51.73
		6½	44.21			6¾	48.7			7¼	51.71			7½	53.53
		6¾	45.88			7	49.81			7½	53.50			7¾	55.32
		7	47.59			7¼	51.60			7¾	55.30		16¼	6¼	45.16
		7¼	49.31			7½	53.39		16¾	6¼	45.11			6½	46.92
		7½	51.3		17¼	6	43.18			6½	46 88			6¾	48.74
	16¼	6	41.29			6¼	44.94			6¾	48 69			7	50.55
		6¼	43.2			6½	46.75			7	50.51			7¼	52.37
		6½	44.71			6¾	48.56			7¼	52.32			7½	54.19
		6¾	46.44			7	50.37			7½	54.14			7¾	56.
		7	48.18			7¼	52.18			7¾	55,90		16½	6¼	45.66
		7¼	49.86	—		7½	53.94		17	6¼	45.60			6½	47.49
		7½	51.60	51	16	6¼	43.55			6½	47.43			6¾	49.33
	16½	6	41.74			6½	45.30			6¾	49.26			7	51.17
		6¼	43.50			6¾	47.6			7	51.10			7¼	53.
		6½	45.25			7	48.76			7¼	52.88			7½	54.79
		6¾	47.			7¼	50.52			7½	54.72			7¾	56.63
		7	48.71			7½	52.28			7¾	56.55		16¾	6¼	46.21
		7¼	50.46			7¾	54.3		17¼	6¼	46.12			6½	48.7
		7½	52.22		16¼	6¼	44.9			6½	47.92			6¾	49.87
	16¾	6	42.24			6½	45.82			6¾	49 78			7	51.73
		6¼	44.2			6¾	47.59			7	51.63			7¼	53.59
		6½	45.74			7	49.37			7¼	53.48			7½	55.44
		6¾	47.51			7¼	51.14			7½	55.34			7¾	57.30
		7	49.29			7½	52.87	—		7¾	57.19		17	6¼	46.71
		7¼	51.6			7¾	54.64	52	16	6¼	44.60			6½	48.58
		7½	52.78		16½	6¼	44.58			6½	46.39			6¾	50.46
	17	6	42.69			6½	46.37			6¾	48.19			7	52.34

L designates length, B breadth, D depth, and T tons.

L	B	D	T	L	B	D	T	L	B	D	T	L	B	D	T
52	17	7 1/4	54.21	53	17 1/2	7 1/2	58.7	55	16 1/4	7 3/4	59.93	56	16 3/4	6 1/2	52.62
		7 1/2	56.9	—		7 3/4	60.1		16 1/2	6 1/4	48.90			6 3/4	54.65
		7 3/4	57.92	54	16	6 1/2	46.70			6 1/2	50.86			7	56.67
	17 1/4	6 1/4	47.25			6 1/2	48.57			6 3/4	52.82			7 1/4	58.70
		6 1/2	49.14			6 3/4	50.45			7	54.78			7 1/2	60.72
		6 3/4	51.4			7	52.32			7 1/4	56.74			7 3/4	62.74
		7	52.89			7 1/4	54.20			7 1/2	58.70			8	64 77
		7 1/4	54.78			7 1/2	56.8			7 3/4	60.66		17	6 1/2	53.25
		7 1/2	56.68			7 3/4	57.90		16 3/4	6 1/4	49.50			6 3/4	55.30
—		7 3/4	58.58		16 1/4	6 1/4	47.29			6 1/2	51.48			7	57.35
53	16	6 1/4	45.65			6 1/2	49.18			6 3/4	53.47			7 1/4	59.39
		6 1/2	47.48			6 3/4	51.8			7	55.45			7 1/2	61.44
		6 3/4	49.32			7	52.93			7 1/4	57.43			7 3/4	63.49
		7	51.15			7 1/4	54.83			7 1/2	59.41			8	65.53
		7 1/4	52.94			7 1/2	56.72			7 3/4	61.40		17 1/4	6 1/2	53.83
		7 1/2	54.78			7 3/4	58.62		17	6 1/4	50.10			6 3/4	55.90
		7 3/4	56.61		16 1/2	6 1/4	47.82			6 1/2	52.10			7	58.2
	16 1/4	6 1/4	46.22			6 1/2	49.74			6 3/4	54.10			7 1/4	60.9
		6 1/2	48.8			6 3/4	51.66			7	56.11			7 1/2	62.15
		6 3/4	49.88			7	53.58			7 1/4	58.11			7 3/4	64.22
		7	51.74			7 1/4	55.50			7 1/2	60.12			8	66.29
		7 1/4	53.60			7 1/2	57.42			7 3/4	62.12		17 1/2	6 1/2	54 45
		7 1/2	55.46			7 3/4	59.33		17 1/4	6 1/4	50.63			6 3/4	56.54
		7 3/4	57.31		16 3/4	6 1/4	48.41			6 1/2	52.66			7	58.63
	16 1/2	6 1/4	46.74			6 1/2	50.35			6 3/4	54.68			7 1/4	60.72
		6 1/2	48.62			6 3/4	52.29			7	56.71			7 1/2	62.81
		6 3/4	50.49			7	54.23			7 1/4	58.74			7 3/4	64.90
		7	52.37			7 1/4	56.17			7 1/2	60.76			8	67.4
		7 1/4	54.25			7 1/2	58.11			7 3/4	62.79	57	16 1/4	6 1/2	52.50
		7 1/2	56.13			7 3/4	60.5		17 1/2	6 1/4	51.21			6 3/4	54.52
		7 3/4	58.		17	6 1/4	48.93			6 1/2	53.26			7	56.54
	16 3/4	6 1/4	47.31			6 1/2	50.89			6 3/4	55.31			7 1/4	58.56
		6 1/2	49.21			6 3/4	52.86			7	57.35			7 1/2	60.58
		6 3/4	51.11			7	54.82			7 1/4	59.40			7 3/4	62.60
		7	53.			7 1/4	56.78			7 1/2	61.45			8	64.62
		7 1/4	54.85			7 1/2	58.74	—		7 3/4	63.49		16 1/2	6 1/2	53.16
		7 1/2	56.75			7 3/4	60.70	56	16 1/4	6 1/2	51.40			6 3/4	55.20
		7 3/4	58.65		17 1/4	6 1/4	49.51			6 3/4	53.38			7	57.24
	17	6 1/4	47.82			6 1/2	51.49			7	55.35			7 1/4	59.28
		6 1/2	49.74			6 3/4	53.47			7 1/4	57.33			7 1/2	61.33
		6 3/4	51.66			7	55.45			7 1/2	59.31			7 3/4	63.37
		7	53.58			7 1/4	57.43			7 3/4	61.29			8	65.41
		7 1/4	55.50			7 1/2	59.42			8	63.27		16 3/4	6 1/2	53.76
		7 1/2	57.42	—		7 3/4	61.40		16 1/2	6 1/2	52.3			6 3/4	55.83
		7 3/4	59.33	55	16 1/4	6 1/4	48.35			6 3/4	54.4			7	57.89
	17 1/4	6 1/4	48.38			6 1/2	50.29			7	56.4			7 1/4	60.1
		6 1/2	50.32			6 3/4	52.23			7 1/4	58.4			7 1/2	62.8
		6 3/4	52.26			7	54.17			7 1/2	60.4			7 3/4	64.14
		7	54.19			7 1/4	56.10			7 3/4	62.4			8	66.21
		7 1/4	56.13			7 1/2	58.4			8	64.4		17	6 1/2	54.41

L designates length, B breadth, D depth, and T tons.

L	B	D	T	L	B	D	T	L	B	D	T	L	B	D	T
57	17	6¾	56.50	58	17¼	7	60.53	59	17⅓	7¼	65.47	61	16½	7½	66.53
		7	58.59			7¼	62.69			7½	67.71			7⅝	68.74
		7¼	60.68			7½	64.84			7⅝	70.1			8	70.94
		7½	62.77			7¾	67.5	—		8	72.25		16¾	6½	58.37
		7¾	64.85			8	69.20	60	16½	6½	56.52			6⅝	60.60
		8	66.94		17½	6½	56.82			6¾	58.69			7	62.83
	17¼	6½	55.5			6¾	59.5			7	60.86			7¼	65.12
		6⅝	57.16			7	61.23			7¼	63.7			7½	67.35
		7	59.27			7¼	63.41			7½	65.24			7¾	69.58
		7¼	61.39			7½	65.59			7¾	67.41			8	71.82
		7½	63.50			7¾	67.76			8	69.57		17	6½	59.8
		7¾	65.61	—		8	69.94		16⅔	6½	57.23			6⅝	61.34
		8	67.72	59	16½	6½	55.40			6¾	59.42			7	63.60
	17½	6½	55.64			6¾	57.53			7	61.61			7¼	65.86
		6⅝	57.77			7	59.65			7¼	63.80			7½	68.17
		7	59.90			7¼	61.78			7½	66.4			7¾	70.42
		7¼	62.9			7½	63.90			7¾	68.24			8	72.68
		7½	64.22			7¾	66.8			8	70.43		17½	6½	59.74
		7¾	66.36			8	68.20		17	6½	57.87			6⅝	62.7
—		8	68.49		16¾	6½	56.9			6¾	60.14			7	64.35
58	16¼	6½	53.61			6¾	58.24			7	62.36			7¼	66.64
		6⅝	55.67			7	60.39			7¼	64.57			7½	68.92
		7	57.73			7¼	62.54			7½	66.79			7¾	71.26
		7¼	59.79			7½	64.69			7¾	69.6			8	73.54
		7½	61.85			7¾	66.84			8	71.27		17½	6½	60.44
		7¾	63.71			8	69.4		17¼	6½	58.56			6¾	62.74
		8	66.2		17	6½	56.72			6⅝	60.81			7	65.10
	16½	6½	54.28			6¾	58.89			7	63.10			7¼	67.41
		6⅝	56.36			7	61.12			7¼	65.34			7½	69.72
		7	58.45			7¼	63.29			7½	67.58			7¾	72.8
		7¼	60.53			7½	65.47			7¾	69.82			8	74.39
		7½	62.62			7¾	67.64			8	72.11		17¾	6½	61.14
		7¾	64.70			8	69.81		17½	6½	59.25			6¾	63.47
		8	66.78		17¼	6½	57.39			6⅝	61.51			7	65.80
	16¾	6½	54.90			6¾	59.59			7	63.78			7¼	68.19
		6⅝	57.6			7	61.79			7¼	66.9			7½	70.52
		7	59.17			7¼	64.4			7½	68·36			7⅝	72.86
		7¼	61.27			7½	66.24			7⅝	70.63	—		8	75.24
		7½	63.38			7¾	68.43			8	72.89	62	16½	6½	58.77
		7¾	65.49			8	70.63		17⅔	6½	59.88			6¾	61.7
		8	67.60		17½	6½	58.6			6⅝	62.22			7	63.32
	17	6½	55.56			6¾	60.28			7	64.51			7¼	65.57
		6⅝	57.70			7	62.50			7¼	66.80			7½	67.82
		7	59.83			7¼	64.73			7½	69.14			7¾	70.11
		7¼	62 1			7½	67.			7⅝	71.43			8	72.36
		7½	64.14			7¾	69.22	—		8	73.72		16⅔	6½	59.51
		7¾	66.27			8	71.44	61	16½	6½	57.65			6⅝	61.78
		8	68.40		17⅓	6½	58.68			6⅝	59.85			7	64.11
	17¼	6½	56.22			6⅝	60.92			7	62.11			7¼	66.38
		6⅝	58.38			7	63.22			7¼	64.32			7½	68 66

L designates length, B breadth, D depth, and T tons.

L	B	D	T	L	B	D	T	L	B	D	T	L	B	D	T
62	16¾	7¾	70.93	63	17¼	8¼	78.82	64	17¾	6¾	67.26	65	18¼	7	72.64
		8	73.26		17½	6¾	65.26			7	69.73			7¼	75.26
	17	6½	60.23			7	67.65			7¼	72.25			7½	77.83
		6¾	62.54			7¼	70.10			7½	74.72			7¾	80.44
		7	64.84			7½	72.50			7¾	77.23			8	83.6
		7¼	67.19			7¾	74.89			8	79.70	—		8¼	85.62
		7½	69.49			8	77.34			8¼	82.22	66	17	6½	64.85
		7¾	71.79			8¼	79.74		18	6¾	68.3			7	69.85
		8	74.14		17¾	6¾	66.2			7	70.53			7½	74.84
	17¼	6½	60.91			7	68.44			7¼	73.7			8	79.83
		6¾	63.28			7¼	70.86			7½	75.57			8½	84.83
		7	65.61			7½	73.34			7¾	78.11		17½	6½	66.42
		7¼	67.94			7¾	75.76			8	80.60			7	71.53
		7½	70.32			8	78.23	—		8¼	83.15			7½	76.64
		7¾	72.64			8¼	80.65	65	17	6¾	66.18			8	81.74
		8	75.2		18	6¾	66.72			7	68.91			8½	86.85
	17½	6½	61.62			7	69.22			7¼	71.9		18	6½	67.93
		6¾	64 3			7¼	71.67			7½	73.52			7	73.20
		7	66.38			7½	74.17			7¾	75.94			7½	78.42
		7¼	68.73			7¾	76.61			8	78.42			8	83.63
		7½	71.14			8	79.11			8¼	80.85			8½	88.85
		7¾	73.49	—		8¼	81.56		17¼	6¾	66.93		18½	6½	69.46
		8	75.84	64	16¾	6¾	64.19			7	69.43			7	74.79
	17¾	6½	62·34			7	66.55			7¼	71.88			7½	80.17
		6¾	64.72			7¼	68.91			7½	74.40			8	85.49
		7	67.15			7½	71.32			7¾	76.86			8½	90.82
		7¼	69.53			7¾	73.68			8	79.36		19	6½	70.93
		7½	71.90			8	76.9			8¼	81.82			7	76.41
		7¾	74.33			8¼	78.45		17½	6¾	67.72			7½	81.85
—		8	76.71		17	6¾	64.93			7	70.25			8	87.34
63	16¾	6¾	63.1			7	67.37			7¼	72.74	—		8½	92.77
		7	65.33			7¼	69.75			7½	75.27	67	17	6½	66.6
		7¼	67.65			7½	72.19			7¾	77.76			7	71.14
		7½	70.1			7¾	74.58			8	80.29			7½	76.22
		7¾	72.33			8	77.1			8¼	82.78			8	81.29
		8	74.65			8¼	79.40		17¾	6¾	68.51			8½	86.37
		8¼	77.2		17¼	6¾	65.71			7	71.7		17½	6½	67.61
	17	6¾	63.73			7	68.18			7¼	73.59			7	72.80
		7	66.13			7¼	70.59			7½	76.15			7½	78.5
		7¼	68.47			7½	73.5			7¾	78.66			8	83.24
		7½	70.82			7¾	75.47			8	81.22			8½	88.43
		7¾	73.21			8	77.88			8¼	83.73		18	6½	69.20
		8	75.55			8¼	80.35		18	6¾	69.30			7	74.51
		8¼	77.90		17½	6¾	66.49			7	71.84			7½	79.82
	17¼	6¾	64.50			7	68.93			7¼	74.43			8	85.17
		7	66.87			7¼	71·42			7½	77.2			8½	90.48
		7¼	69.29			7½	73.86			7¾	79.55		18½	6½	70.71
		7½	71.66			7¾	76.35			8	82.14			7	76.18
		7¾	74.8			8	78.79			8¼	84.68			7½	81.60
		8	76.45			8¼	81.28		18¼	6¾	70.8			8	87.7

L designates length, B breadth, D depth, and T tons.

L	B	D	T	L	B	D	T	L	B	D	T	L	B	D	T
67	18½	8½	92.49	69	19	8½	97.87	71	19	9	107.26	73	18¼	9	107.26
	19	6½	72.26		19½	6¾	79.36		19½	7	85.19		19	7¼	89.30
		7	77.79			7	82.31			7½	91.27			7½	95.45
		7½	83.38			7½	88.19			8	97.35			8	98.53
		8	88.91			8	94.8			8½	103.43			8½	104.68
—		8½	94.49	—		8½	99.92			9	109.51			9	110.83
68	17½	6¾	71.46	70	18	7	78.49		20	7	86.90		19½	7¼	91.20
		7	74.13			7½	84.12			7½	93.15			7¾	97.48
		7½	79.41			8	89.69			8	99 35			8	100.62
		8	84.69			8½	95.32			8½	105.55			8½	106.90
		8½	90.2			9	100.90			9	111.75			9	113.22
	18	6¾	73.14		18½	7	80.27		21	7	90.34		20	7¼	93.10
		7	75.82			7½	86.2			7½	96.78			7¾	99.50
		7½	81.27			8	91.71			8	103.26			8	102.70
		8	86.66			8½	97.46			8½	109.69			8½	109.15
		8½	92.11			9	103.21	—		9	116.17			9	115.55
	18½	6¾	74.75		19	7	82.3	72	18	7	81.16		20½	7¼	94.91
		7	77.53			7½	87.85			7½	86.92			7¾	101.48
		7½	83.9			8	93.72			8	92.72			8	104.74
		8	88.60			8½	99.58			8½	98 53			8½	111.31
		8½	94.17			9	105.45			9	104 34			9	117.83
	19	6¾	76.38		19½	7	83.72		18½	7	83.1		21	7¼	96.75
		7	79.22			7½	89.71			7½	88.89			7¾	103.45
		7½	84.85			8	95.69			8	94.82			8	106.77
		8	90.53			8½	101.67			8½	100.76			8½	113.46
		8½	96.20			9	107.66			9	106 69	—		9	120.15
	19½	6¾	78.		20	7	85.45		19	7	84.79	74	18¼	7¼	87.77
		7	80.84			7½	91.55			7½	90.85			7¾	93.82
		7½	86.63			8	97.65			8	96.91			8	96.85
		8	92.42			8½	103.75			8½	103.1			8½	102.90
—		8½	98.21			9	109.85			9	109.7			9	109.
69	17½	6¾	72.69		21	7	88.77		19½	7	86 60		19	7¼	90.73
		7	75.40			7½	95.15			7½	92.78			7¾	97.2
		7½	80.77			8	101.48			8	99.1			8	100.15
		8	86.19			8½	107.80			8½	105.19			8½	106.39
		8½	91.56	—		9	114.18			9	111.37			9	112.64
	18	6¾	74.41	71	18	7	79.80		20	7	88.40		19½	7¼	92.67
		7	77.18			7½	85.52			7½	94.70			7¾	99.9
		7½	82.67			8	91.23			8	101.5			8	102.28
		8	88.20			8½	96.90			8½	107.35			8½	108.65
		8½	93.69			9	102.62			9	113.65			9	115.8
	18½	6¾	76.9		18½	7	81.61		21	7	91 86		20	7¼	94.60
		7	78.87			7½	87.45			7½	98.45			7¾	101.15
		7½	84.53			8	93.29			8	105.4			8	104.40
		8	90.18			8½	99.13			8½	111.57			8½	110.90
		8½	95.79			9	104.92	—		9	118.16			9	117.45
	19	6¾	77.72		19	7	83.41	73	18¼	7½	86 39		20½	7¼	96.49
		7	80.60			7½	89.38			7¾	92.36			7¾	103.17
		7½	86.38			8	95.34			8	95.34			8	106.48
		8	92.15			8½	101.30			8¼	101 30			8¼	113.15

L designates length, B breadth, D depth, and T tons.

L	B	D	T
74	20½	9	119.78
	21	7¼	98.38
		7¾	105.17
		8	108.55
		8½	115.34
		9	122.14
75	18½	7¼	90.20
		7¾	96.41
		8	99.51
		8½	105.72
		9	111.93
	19	7¼	92.20
		7¾	98.55
		8	101.72
		8½	108.11
		9	114.45
	19½	7¼	94.18
		7¾	100.65
		8	103.89
		8½	110.41
		9	116.88
	20	7¼	96.15
		7¾	102.75
		8	106.10
		8½	112.70
		9	119.35
	20½	7¼	98.8
		7¾	104.81
		8	108.22
		8½	115.
		9	121.72
	21	7¼	100.
		7¾	106.85
		8	110.33
		8½	117.23
		9	124.13
76	18½	7¼	91.59
		7¾	97.89
		8	101.9
		8½	107.40
		9	113.70
	19	7¼	93.63
		7¾	100.12
		8	103.34
		8½	109.77
		9	116.26
	19½	7¼	95.65
		7¾	102.26
		8	105.55
		8½	112.17
76	19½	9	118.74
	20	7¼	97.65
		7¾	104.40
		8	107.75
		8½	114.50
		9	121.25
	20½	7¼	99.62
		7¾	106.49
		8	109.91
		8½	116.79
		9	123.67
	21	7¼	101.57
		7¾	108.58
		8	112.11
		8½	119.11
		9	126.12
77	18½	7¼	93.3
		7¾	99.43
		8	102.62
		8½	109.7
		9	115.46
	19	7¼	95.11
		7¾	101.64
		8	104.91
		8½	111.49
		9	118.7
	19½	7¼	97.16
		7¾	103.83
		8	107.21
		8½	113.88
		9	120.59
	20	7¼	99.20
		7¾	106.5
		8	109.45
		8½	116.30
		9	123.15
	20½	7¼	101.20
		7¾	108.18
		8	111.65
		8½	118.63
		9	125.61
	21	7¼	103.19
		7¾	110.31
		8	113.84
		8½	121.
		9	128.11
78	18½	7¼	94.42
		8	104.20
		8¼	107.45
		8¾	113.94
78	18½	9	117.23
	19½	7¼	98.62
		8	108.82
		8¼	112.25
		8¾	119.7
		9	122.45
	20	7¼	100.70
		8	111.15
		8¼	114.60
		8¾	121.55
		9	125.5
	20½	7¼	102.74
		8	113.39
		8¼	116.91
		8¾	124.4
		9	127.56
	21	7¼	104.77
		8	115.62
		8¼	119.25
		8¾	126.47
		9	130.10
	22	7¼	108.75
		8	120.4
		8½	127.52
		9	135.5
		9½	142.53
79	18¾	7¼	96.89
		8	106.92
		8¼	110.30
		8¾	117.
		9	120.32
	19½	7¼	100.14
		8	110.48
		8¼	113.91
		8¾	120.82
		9	124.30
	20	7¼	102.25
		8	112.80
		8¼	116.35
		8¾	123.40
		9	126.90
	20½	7¼	104.32
		8	115.13
		8¼	118.70
		8¾	125.88
		9	129.50
	21	7¼	106.39
		8	117.40
		8¼	121.8
		8½	124.72
79	21	9	132.9
	22	7¼	110.45
		8	121 85
		8½	129 49
		9	137.13
		9½	144.72
80	18¾	7¼	98.35
		8	108.53
		8¼	111.89
		8¾	118.69
		9	122.11
	19½	7¼	101.60
		8	112.14
		8¼	115.62
		8¾	122.63
		9	126.16
	20	7¼	103.75
		8	114.50
		8¼	118.10
		8¾	125.25
		9	128.80
	20½	7¼	105.86
		8	116.82
		8¼	120.49
		8¾	127.78
		9	131.45
	21	7¼	108.1
		8	119.18
		8¼	122.87
		8¾	130.34
		9	134.8
	22	7¼	112.14
		8	123.71
		8½	131.46
		9	139.21
		9½	146.91
81	18¾	7¼	99.76
		8	110.12
		8¼	113.54
		8¾	120.43
		9	123.85
	19½	7¼	103.11
		8	113.75
		8¼	117.33
		8¾	124.43
		9	128.1
	20	7¼	105.30
		8	116.20
		8¼	119.80
		8¾	127.10

L designates length, B breadth, D depth, and T tons.

L	B	D	T	L	B	D	T	L	B	D	T	L	B	D	T
81	20	9	130.70	82	22	9	143.37	84	19	7¼	105.25	85	19½	8	120.34
	20½	7½	107.45			9½	151.34			7½	108.85			8½	127.84
		8	118.56		23	7½	119.67			8	116.15			9	135 38
		8¼	122.28			7½	123.79			8½	123.39			9½	142.88
		8½	126.			8	132.8			9	130.64		20	7¼	111.40
		9	133.39			8½	140.33			9½	137.89			7½	115.25
	21	7¼	109.58			9	148.57		19½	7¼	107.56			8	122.90
		8	120.91	—		9½	156.81			7½	111.28			8½	130.60
		8¼	124.70	83	19	7¼	103.77			8	118.68			9	138.30
		8½	128.49			7½	107.38			8½	126.13			9½	146.
		9	136.7			8	114.53			9	133.53		20½	7¼	113.69
	22	7¼	113.79			8½	121.68			9½	140.93			7½	117.62
		8	125.57			9	128.83		20	7¼	109.85			8	125.47
		8½	133.43			9½	136.3			7½	113.65			8½	133.32
		9	141.29		19½	7¼	106.9			8	121.25			9	141.17
—		9½	149.15			7½	109.72			8½	128.80			9½	149.2
82	19	7¼	102.35			8	117.7			9	136.40		21	7¼	116.2
		7½	105.85			8½	124 37			9½	144.			7½	120.3
		8	112.91			9	131.67		20½	7¼	112.16			8	128.3
		8¼	120.1			9½	139.2			7½	116.3			8½	136.3
		9	127.7		20	7¼	108.35			8	123.73			9	144.3
		9½	134.13			7½	112.10			8½	131.48			9½	152.3
	19½	7¼	104.58			8	119.55			9	139.23		22	7¼	120.52
		7½	108.21			8½	127.5			9½	146.93			7½	124.67
		8	115.41			9	134.50		21	7¼	114.40			8	133.1
		8½	122.61			9½	142.			7½	118.35			8½	141.31
		9	129.82		20½	7¼	110.57			8	126.25			9	149.61
		9½	137.7			7½	114.39			8½	134.14			9½	157.91
	20	7¼	106.80			8	122.4			9	142.4		23	7¼	124.92
		7½	110.50			8½	129.64			9½	149.89			7½	129.27
		8	117.85			9	137.28		22	7¼	118.82			8	137.85
		8½	125.25			9½	144.88			7½	122.92			8½	146.49
		9	132.60		21	7¼	112.78			8	131.15			9	155.13
		9½	140.			7½	116.68			8½	139.34	—		9½	163.72
	20½	7¼	109.3			8	124.47			9	147 53	86	19¼	7¼	109.35
		7½	112.76			8½	132.26			9½	155.72			8	120.65
		8	120.30			9	140.5		23	7¼	123.20			8½	128.21
		8½	127.79			9½	147.79			7½	127.44			9	135.73
		9	135.34		22	7¼	117.18			8	135.91			9½	143.30
		9½	142.83			7½	121.22			8½	144.43		20	7¼	112.90
	21	7¼	111.21			8	129.29			9	152.91			8	124.60
		7½	115.5			8½	137.37	—		9½	161.43			8½	132.40
		8	122.69			9	145.45	85	19	7¼	106.68			9	140.20
		8½	130.37			9½	153.53			7½	110.38			9½	148.
		9	138.6		23	7¼	121.44			8	117.72		20½	7¼	115.28
		9½	145.70			7½	125.62			8½	125.11			8	127.21
	22	7¼	115.48			8	134.2			9	132.45			8½	135.16
		7½	119.47			8½	142.38			9½	139.79			9	143.12
		8	127.43			9	150.74		19½	7¼	109.7			9½	151.7
		8½	135.40			9½	159.15			7½	112.79		21	7¼	117.60

L designates length, B breadth, D depth, and T tons.

L	B	D	T	L	B	D	T	L	B	D	T	L	B	D	T
86	21	8	129.76	87	23	8	141.73	89	20½	8	132.38	90	22	8	142.26
		8½	137.86			8½	150.60			8½	140.84			8½	151.16
		9	146.2			9	159.47			9	148.90			9	160.6
		9½	154.13	—		9½	168.34			9½	157.21			9½	163.91
	21½	7¼	119.89	88	19¼	7¼	112.29		21	7¼	122.41		23	7½	138.34
		8	132.32			8	123.88			8	135·10			8	147.55
		8½	140.58			8½	131.64			8½	143.52			8½	156.77
		9	148.84			9	139.39			9	151.94			9	166.3
		9½	157.15			9½	147.15			9½	160.41			9½	175.24
	22	7¼	122.21		20	7¼	116.		21½	7¼	124.81		24	7½	143.23
		8	134.82			8	128.			8	137.73			8	152.75
		8½	143.28			8½	136.			8½	146.36			8½	162.32
		9	151.69			9	144.			9	154.94			9	171.84
		9½	160.15			9½	152.			9½	163.57	—		9½	181.41
	23	7¼	126.69		20½	7¼	118.40		22	7¼	127.25	91	19½	7½	122.7
		8	139.79			8	130.64			8	140.40			8	130.20
		8½	148.55			8½	138.80			8½	149.19			8½	138.33
		9	157.30			9	147.1			9	157.93			9	146.46
—		9½	166.5			9½	155.17			9½	166.72			9½	154.59
87	19¼	7¼	110.79		21	7¼	120.79		23	7¼	131.94		20	7½	124.70
		8	122.29			8	133.32			8	145.61			8	133.5
		8½	129.90			8½	141.63			8½	154.71			8½	141.35
		9	137.56			9	150.			9	163.81			9	149.65
		9½	145.22			9½	158.32	—		9½	172.91			9½	158.
	20	7¼	114.45		21½	7¼	123.20	90	19½	7¼	120.51		20½	7½	127.34
		8	126.30			8	135.91			8	128.54			8	135.81
		8½	134.20			8½	144.44			8½	136.57			8½	144.33
		9	142.10			9	152.91			9	144.61			9	152.79
		9½	150.			9½	161.43			9½	152.64			9½	161.31
	20½	7¼	116.81		22	7¼	125.55		20	7½	123.15		21	7½	129.93
		8	128.90			8	138.54			8	131.35			8	138.61
		8½	137.1			8½	147.22			8½	139.55			8½	147.29
		9	145.6			9	155.85			9	147.75			9	155.92
		9½	153.12			9½	164.53			9½	156.			9½	164.60
	21	7¼	119.22		23	7¼	130.22		20½	7½	125.71		21½	7½	132.53
		8	131.54			8	143.67			8	134.12			8	141.37
		8½	139.75			8½	152.66			8½	142.48			8½	150.22
		9	148.1			9	161.64			9	150.85			9	159.6
		9½	156.22	—		9½	170.62			9½	159.26			9½	167.86
	21½	7¼	121.54	89	19¼	7¼	113.74		21	7½	128.30		22	8	144.12
		8	134.14			8	125.52			8	136.83			8½	153.13
		8½	142.51			8½	133.37			8½	145.40			9	162.14
		9	150.87			9	141.23			9	153.93			9½	171.15
		9½	159.29			9½	149.8			9½	162.51			10	180.16
	22	7¼	123.86		20	7¼	117.50		21½	7½	130.82		23	8	149.49
		8	136.68			8	129.65			8	139.55			8½	158.82
		8½	145.25			8½	137.75			8½	148.29			9	168.20
		9	153.77			9	145.85			9	157.3			9½	177.53
		9½	162.34			9½	154.			9½	165.72			10	186.86
	23	7½	128.46		20½	7¼	119.94		22	7½	133.37		24	8	154.77

L designates length, B breadth, D depth, and T tons.

L	B	D	T	L	B	D	T	L	B	D	T	L	B	D	T
91	24	8½	164.46	93	20	8	136.40	94	21	8	143.90	5	22	8½	161.1
		9	174.15			8½	144.90			8½	152.89			9	170.46
		9½	183.79			9	153.45			9	161.89			9½	179.91
—		10	193.49			9½	162.			9½	170.89			10	189.41
92	19½	7½	123.58		20½	7½	130.57		21½	7½	137.62		23	8	157.25
		8	131.81			8	139.29			8	146.78			8½	167.9
		8½	140.9			8½	148.1			8½	156.			9	176.88
		9	148.32			9	156.68			9	165.17			9½	186.72
		9½	156.55			9½	165.40			9½	174.34			10	196.56
	20	7½	126.30		21	7½	133.28		22	8	149.65		24	8	162.85
		8	134.70			8	142.17			8½	159.4			8½	173.7
		8½	143.15			8½	151.6			9	168.38			9	183.24
		9	151.55			9	159.90			9½	177.72			9½	193.41
		9½	160.			9½	168.79			10	187.11	—		10	203.59
	20½	7½	128.93		21½	7½	135.90		23	8	155.31	96	19½	7½	129.73
		8	137.55			8	145.1			8½	165.4			8	138.40
		8½	146.17			8½	154.7			9	174.71			8½	147.7
		9	154.74			9	163.13			9½	184.43			9	155.69
		9½	163.36			9½	172.19			10	194.16			9½	164.36
	21	7½	131.60		22	8	147.79		24	8	160.83		20	7½	132.60
		8	140.39			8½	157.7			8½	170.88			8	141.45
		8½	149.17			9	166.30			9	180.93			8½	150.30
		9	157.91			9½	175.53			9½	191.3			9	159.15
		9½	166.70			10	184.76	—		10	201.9			9½	168.
	21½	7½	134.24		23	8	153.37	95	19½	7½	128.22		20½	7½	135.43
		8	143.19			8½	162.93			8	136.74			8	144.46
		8½	152.15			9	172.54			8½	145.31			8½	153.49
		9	161.10			9½	182.15			9	153.83			9	162.52
		9½	170·5			10	191.71			9½	162.40			9½	171.55
	22	8	145.93		24	8	158.81		20	7½	131.5		21	7½	138.25
		8½	155.10			8½	168.74			8	139.75			8	147.46
		9	164.22			9	178.67			8½	148.50			8½	156.66
		9½	173.34			9½	188.60			9	157.25			9	165.87
		10	182.46	—		10	198.54			9½	166.			9½	175.13
	23	8	151.43	94	19½	7½	126.66		20½	7½	133.79		21½	7½	141.4
		8½	160.88			8	135.13			8	142.72			8	150.42
		9	170.37			8½	143.55			8½	151.65			8½	159.81
		9½	179.81			9	152.3			9	160.57			9	169.24
		10	189.31			9½	160.45			9½	169.50			9½	178.62
	24	8	156.79		20	7½	129.45		21	7½	136.58		22	8	153.37
		8½	166.60			8	138.10			8	145 68			8½	162.93
		9	176.41			8½	146.70			8½	154.78			9	172.54
		9½	186.22			9	155.35			9	163 88			9½	182.15
		10	196.4			9½	164.			9½	173.3			10	191.71
—															
93	19½	7½	125.14		20½	7½	132.21		21½	7½	139.33		23	8	159.19
		8	133.47			8	141.3			8	148.60			8½	169.15
		8½	141.80			8½	149.80			8½	157.88			9	179.10
		9	150.17			9	158.63			9	167.20			9½	189.5
		9½	158.50			9½	167.45			9½	176.48			10	199.1
	20	7½	127.85		21	7½	134.90		22	8	151.51		24	8	164.87

L designates length, B breadth, D depth, and T tons.

L	B	D	T	L	B	D	T	L	B	D	T	L	B	D	T
96	24	8½	175.21	98	20	7½	135.75	99	20½	8½	159.2	100	22	9	180.86
		9	185.50			8	144.80			9	168.35			9½	190.91
		9½	195.79			8½	153.85			9½	177.69			10	201·1
		10	206.14			9	162.90			10	187.8		23	8	166.90
97	19½	7½	131.29			9½	172.		21	7½	143.23			8½	177.37
		8	140.6			10	181.5			8	152.75			9	187.78
		8½	148.78		20½	7½	138.66			8½	162.32			9½	198.24
		9	157.54			8	147.89			9	171.84			10	208.66
		9½	166.31			8½	157.17			9½	181.41		24	8	173.
	20	7½	134.20			9	166.41			10	190.94			8½	183.77
		8	143.15			9½	175.64		22	7½	149.2			9	194.59
		8½	152.10			10	184.88			8	158.90			9½	205.41
		9	161.5		21	7½	141.55			8½	168.84			10	216.24
		9½	170.			8	151.2			9	178.78			10½	227.6
	20½	7½	137.7			8½	160.43			9½	188.72		25	8	178.90
		8	146.20			9	169.85			10	198.66			8½	190.12
		8½	155.33			9½	179.32		23	7½	154.67			9	201.30
		9	164.46			10	188.74			8	165.1			9½	212.47
		9½	173.59		22	7½	147 27			8½	175.31			10	223.65
	21	7½	139.88			8	157.9			9	185.61	101		10½	234.82
		8	149.24			8½	166.87			9½	195.91		20	8	149.85
		8½	158.55			9	176.70			10	206.26			8½	159.25
		9	167.86			9½	186.53		24	7½	160.28			9	168.60
		9½	177.22			10	196.36			8	170.93			9½	178.
	21½	7½	142.70		23	7½	152.84			8½	181.63			10	187.35
		8	152.24			8	163.7			9	192.33		20½	8	153.11
		8½	161.73			8½	173.26			9½	203.3			8½	162.65
		9	171.27			9	183.44	100		10	213.69			9	172.24
		9½	180.76			9½	193.62		20	8	148.20			9½	181.78
	22	8	155.23			10	203.81			8½	157.45			10	191.38
		8½	164.90		24	7½	158.38			9	166.70		21	8	156.31
		9	174.62			8	168.91			9½	176.			8½	166.9
		9½	184.34			8½	179.49			10	185.25			9	175.82
		10	194.6			9	190.7		20½	8	151.37			9½	185.60
	23	8	161.13			9½	200.60			8½	160.81			10	195.39
		8½	171.20			10	211.19			9	170.30		21½	8	159.47
		9	181.27	99	19½	7½	134.37			9½	179.74			8½	169.44
		9½	191.34			8	143.33			10	189.23			9	179.41
		10	201.41			8½	152.29		21	8	154.53			9½	189.38
	24	8	166.89			9	161.25			8½	164.20			10	199.36
		8½	177.35			9½	170.21			9	173.83		22	8	162.62
		9	187.76			10	179.18			9½	183.51			8½	172.78
		9½	198.22		20	7½	137.35			10	193.19			9	182.94
		10	208.64			8	146.50		21½	8	157.65			9½	193.15
98	19½	7½	132.81			8½	155.65			8½	167.52			10	203.31
		8	141.67			9	164.80			9	177.38		23	8	168.84
		8½	150.53			9½	174.			9½	187.24			8½	179.42
		9	159.40			10	183.15			10	197.11			9	190.
		9½	168.26		20½	7½	140.29		22	8	160.76			9½	200.53
		10	177.13			8	149.63			8½	170.81			10	211.11

L designates length, B breadth, D depth, and T tons.

L	B	D	T
101	24	8	175·2
		8½	185.91
		9	196.85
		9½	207.79
		10	218.74
		10½	229 68
	25	8	181.5
		8½	192.35
		9	203.65
		9½	215.
		10	226.30
		10½	237.60
102	20	8	151.55
		8½	161.5
		9	170.50
		9½	180.
		10	189.45
	20½	8	154.80
		8½	164.49
		9	174.19
		9½	183.83
		10	193.53
	21	8	158.9
		8½	167.92
		9	177.81
		9½	187.70
		10	197.59
	21½	8	161.29
		8½	171.37
		9	181.45
		9½	191.53
		10	201.61
	22	8	164.48
		8½	174.75
		9	185.7
		9½	195.34
		10	205.61
	23	8	170.78
		8½	181.48
		9	192.17
		9½	202.81
		10	213.51
	24	8	177.5
		8½	188.12
		9	199 18
		9½	210.24
		10	221.31
	25	8	183.15
		8½	194.57
		9	206.5
102	25	9½	217.47
		10	228.90
		10½	240.37
		11	251.80
103	20	8	153.25
		8½	162.80
		9	172.40
		9½	182.
		10	191.55
	20½	8	156.54
		8½	166.34
		9	176.13
		9½	185.88
		10	195 68
	21	8	159.82
		8½	169.81
		9	179.80
		9½	189.79
		10	199.79
	21½	8	163.11
		8½	173.30
		9	183.48
		9½	193.67
		10	203.86
	22	8	166.34
		8½	176.72
		9	187.15
		9½	197.53
		10	207.91
	23	8	172.72
		8½	183.53
		9	194.34
		9½	205.15
		10	215.91
	24	8	179.6
		8½	190.24
		9	201.42
		9½	212.60
		10	223.79
	25	8	185.25
		8½	196.80
		9	208.40
		9½	220.
		10	231.55
		10½	243.15
		11	254.70
104	20	8	154.90
		8½	164.60
		9	174 30
		9½	184.
104	20	10	193.65
	20½	8	158.28
		8½	168.18
		9	178.8
		9½	187.93
		10	197.83
	21	8	161.60
		8½	171.69
		9	181.79
		9½	191.89
		10	202.4
	21½	8	164.88
		8½	175.23
		9	185.52
		9½	195.81
		10	206.16
	22	8	168.20
		8½	178.69
		9	189.23
		9½	199.72
		10	210.26
	23	8	174.66
		8½	185.59
		9	196.51
		9½	207.43
		10	218.36
	24	8	181.8
		8½	192.38
		9	203.68
		9½	215.3
		10	226.34
	25	8	187 35
		8½	199.7
		9	210.75
		9½	222.47
		10	234.20
		10½	245.87
		11	257.60
105	20	8	156.60
		8½	166.40
		9	176.20
		9½	186.
		10	195.75
	20½	8	160.2
		8½	170.2
		9	180.2
		9½	190.2
		10	200.3
	21	8	163.38
		8½	173.58
105	21	9	183.78
		9½	194.3
		10	204 24
	21½	8	166.70
		8½	177.15
		9	187.55
		9½	198.
		10	208.41
	22	8	170.6
		8½	180.66
		9	191.31
		9½	201.91
		10	212.56
	23	8	176.60
		8½	187.64
		9	198.68
		9½	209.72
		10	220.76
	24	8	183.10
		8½	194.52
		9	205.94
		9½	217.41
		10	228.84
	25	8	189.45
		8½	201.30
		9	213.15
		9½	225.
		10	236.80
		10½	248.65
		11	260.50
106	20	8	158.30
		8½	168.20
		9	178.10
		9½	188.
		10	197.85
		10½	207.75
	20½	8	161.71
		8½	171.81
		9	181 92
		9½	192.7
		10	202.18
		10½	212.28
	21	8	165.16
		8½	175.46
		9	185.77
		9½	196.13
		10	206.44
		10½	216.74
	22	8	171.87
		8½	182.63

L designates length, B breadth, D depth, and T tons.

L	B	D	T	L	B	D	T	L	B	D	T	L	B	D	T
106	22	9	193.39	107	22	9	195.47	108	22	9	197.55	109	22	11	244.3
		9½	204.15			9½	206.34			9½	208.53		23	8	184.36
		10	214.86			10	217.21			10	219.51			8½	195.86
		10½	225.61			10½	228.7			10½	230.48			9	207.41
	22½	8	175 24		22½	8	177.14		22½	8	179.4			9½	218.91
		8½	186.20			8½	188.21			8½	190.22			10	230.46
		9	197.15			9	199.28			9	201.40			10½	242.
		9½	208.11			9½	210.35			9½	212.58			11	253.50
		10	219.7			10	221.42			10	223.77		24	8	191.18
		10½	230.2			10½	232.48			10½	235.			8½	203.13
	23	8	178.54		23	8	180.48		23	8	182.42			9	215.8
		8½	189.70			8½	191.75			8½	193.81			9½	227.3
		9	200.85			9	203.7			9	205.24			10	238.94
		9½	212.5			9½	214.34			9½	216.62			10½	250.89
		10	223.21			10	225.61			10	228.6			11	262.84
		10½	234.36			10½	236.87			10½	239.44		25	8	197.85
	24	8	185.12		24	8	187.14		24	8	189.16			8½	210.25
		8½	196.66			8½	198.80			8½	200.94			9	222.60
		9	208.25			9	210.51			9	212.77			9½	235.
		9½	219.79			9½	222.22			9½	224.60			10	247.35
		10	231.39			10	233.89			10	236.44			10½	259.70
		10½	242.93			10½	245.60			10½	248.27			11	272.10
		11	254.52			11	257.31			11	260.10	110	20½	8	168.62
	25	8	191.55		25	8	193.65		25	8	195.75			8½	179.18
		8½	203.52			8½	205.75			8½	208.2			9	189.70
		9	215.50			9	217.85			9	220.25			9½	200.26
		9½	227.47			9½	230.			9½	232.47			10	210.78
		10	239.45			10	242.10			10	244.70			10½	221.34
		10½	251.42			10½	254.20			10½	256.92			11	231.85
107		11	263.40	108		11	266.30	109		11	269.20		21	8	172.23
	20	8	160.		20	8	161.65		20½	8	166.88			8½	183.
		8½	170.			8½	171.75			8½	177.34			9	193.73
		9	180.			9	181.85			9	187.75			9½	204.51
		9½	190.			9½	192.			9½	198.21			10	215.29
		10	200.			10	202.10			10	208.63			10½	226.6
		10½	210.			10½	212.20			10½	219.9			11	236.79
	20½	8	163.45		20½	8	165.19			11	229.50		22½	8	182.79
		8½	173.66			8½	175.50		21	8	170.45			8½	194.25
		9	183.86			9	185.81			8½	181.12			9	205.65
		9½	194.12			9½	196.17			9	191.74			9½	217.11
		10	204.33			10	206.48			9½	202.41			10	228.52
		10½	214.53			10½	216.78			10	213.9			10½	239.92
	21	8	166.89		21	8	168.67			10½	223.71			11	251.38
		8½	177.35			8½	179.23			11	234.38		23	8	186.30
		9	187.76			9	189.75		22	8	177.45			8½	197.92
		9½	198.22			9½	200.32			8½	188.54			9	209.58
		10	208.64			10	210.84			9	199.63			9½	221.24
		10½	219.10			10½	221.40			9½	210.72			10	232.86
	22	8	173.73		22	8	175.59			10	221.81			10½	244.52
		8½	184.60			8½	186.57			10½	232.89			11	256.18

L designates length, B breadth, D depth, and T tons.

L	B	D	T	L	B	D	T	L	B	D	T	L	B	D	T
110	24	8	193.20	111	26	8½	221.88	113	21	9½	210.79	114	21	11	246.53
		8½	205.27			9	234.93			10	221.89			12	268.92
		9	217.34			9½	248:3			10½	233.3		22	8½	198.39
		9½	229.41			10	261.9			11	244.12			9	210.8
		10	241.49			10½	274.14			12	266.30			9½	221.72
		10½	253.56			11	287.19		22	8½	196.42			10	233.41
		11	265.63	112	21	8	175.74			9	208.			10½	245.9
	25	8	200.			8½	186.72			9½	219.53			11	256.73
		8½	212.47			9	197.71			10	231.11			12	280.11
		9	225.			9½	208.70			10½	242.63		23	8½	206.19
		9½	237.47			10	219.69			11	254.21			9	218.31
		10	250.			10½	230.67			12	277.32			9½	230.43
		10½	262.47			11	241.66		23	8½	204.13			10	242.56
		11	275.		22	8	183.3			9	216.14			10½	254.68
111	21	8	174.1			8½	194.45			9½	228.15			11	266.80
		8½	184.84			9	205.87			10	240.16			12	291.10
		9	195.72			9½	217.34			10½	252.16		24	8½	213.83
		9½	206.60			10	228.76			11	264.17			9	226.43
		10	217.49			10½	240.22			12	288.19			9½	239.3
		10½	228.37			11	251 64		24	8½	211.69			10	251.59
		11	239.25		23	8	190.18			9	224.17			10½	264.19
	22	8	181.17			8½	202.8			9½	236.60			11	276.74
		8½	192.48			9	213.92			10	249.9			12	301.89
		9	203.79			9½	225.81			10½	261.52		25	8½	221.42
		9½	215.15			10	237.71			11	274.			9	234.45
		10	226.46			10½	249.60			12	298.86			9½	247.47
		10½	237.76			11	261.49		25	8½	219.20			10	260 50
		11	249.12		24	8	197.24			9	232.10			10½	273.52
	23	8	188.24			8½	209.55			9½	245.			11	286.55
		8½	200.2			9	221.86			10	257.85			12	312.60
		9	211.75			9½	234.22			10½	270.75		26	9	242.35
		9½	223.53			10	246.54			11	283.65			9½	255.79
		10	235.31			10½	258.85			12	309.45			10	269.29
		10½	247.8			11	271.21		26	9	239.86			10½	282.73
		11	258.81		25	8	204.20			9½	253.22			11	296.22
	24	8	195.22			8½	216.92			10	266.54			12	323.15
		8½	207.41			9	229.70			10½	279.85		27	9½	264.5
		9	219.60			9½	242.47			11	293.21			10	277.91
		9½	231.79			10	255.25			12	319.83			10½	291.81
		10	244.4			10½	268.2		27	9½	261.34			11	305.71
		10½	256.23			11	280.75			10	275.11			12	333.52
		11	268.42		26	8	211.6			10½	288.82			13	361.32
	25	8	202.10			8½	224.24			11	302.59	115	21	8½	192.38
		8½	214.70			9	237.42			12	330.13			9	203.68
		9	227.35			9½	250.60			13	357.61			9½	215.3
		9½	240.			10	263.79	114	21	8½	190.49			10	226.34
		10	252.60			10½	277.2			9	201.69			10½	237.64
		10½	265.25			11	290.20			9½	212.89			11	248.94
		11	277.85	113	21	8½	188.61			10	224.14			12	271.59
	26	8	208.83			9	199.70			10½	235.33		22	8½	200.36

L designates length, B breadth, D depth, and T tons.

L	B	D	T
115	22	9	212.16
		9½	223.91
		10	235.71
		10½	247.50
		11	259.30
		12	282.85
	23	8½	208.24
		9½	232.72
		10	245.1
		10½	257.24
		11	269.48
		12	294.1
		13	318.48
	24	8½	216.2
		9½	241.41
		10	254.14
		10½	266.81
		11	279.53
		12	304.92
		13	330.37
	25	8½	223.65
		9½	250.
		10	263.15
		10½	276.30
		11	289.45
		12	315.75
		13	342.10
	26	9½	258.41
		10	272.4
		10½	285.61
		11	299.23
		12	326.42
		13	353.62
	27	9½	266.72
		10	280.76
		10½	294.79
		11	308 83
		12	336.91
		13	365.3
116	21	8½	194.26
		9	205.67
		9½	217.13
		10	228.54
		10½	239.94
		11	251.40
		12	274.26
	22	8½	202.33
		9	214.24
		9½	226.15
		10	238.6

L	B	D	T
116	22	10½	249.91
		11	261.82
		12	285.64
	23	9½	235.5
		10	247.41
		10½	259.76
		11	272.16
		12	296.87
		13	321.62
		14	346.38
	24	9½	243.79
		10	256.64
		10½	269.48
		11	282.32
		12	308.
		13	333.64
		14	359.32
	25	9½	252.47
		10	265.75
		10½	279.7
		11	292.35
		12	318.90
		13	345.50
		14	372.10
	26	9½	261.3
		10	274.74
		10½	288.49
		11	302.24
		12	329.69
		13	357.20
		14	384.65
	27	9½	269.43
		10	283.61
		10½	297.78
		11	312.
		12	340.35
		13	368.69
		14	397.9
117	21½	9	212.2
		9½	223.76
		10	235.56
		10½	247.35
		11	259.14
		12	282.67
	22	9	216.32
		9½	228.34
		10	240.36
		10½	252.37
		11	264.39
		12	288.43

L	B	D	T
117	23	9½	237.34
		10	249.81
		10½	262.32
		11	274.79
		12	299.78
		13	324.76
		14	349.75
	24	9½	246.22
		10	259.19
		10½	272.15
		11	285.11
		12	311 3
		13	336.91
		14	362.83
	25	9½	255.
		10	268.40
		10½	281.80
		11	295.25
		12	322.10
		13	348.90
		14	375.75
	26	9½	263.60
		10	277.49
		10½	291.37
		11	305.25
		12	333.1
		13	360 73
		14	388.49
	27	9½	272.15
		10	286.46
		10½	300.76
		11	315 12
		12	343.74
		13	372.40
		14	401.7
118	21½	9	214.6
		9½	225.91
		10	237.81
		10½	249.70
		11	261.60
		12	285.40
	22	9	218.40
		9½	230.53
		10	242.66
		10½	254.78
		11	266.91
		12	291.22
	23	9½	239.62
		10	252.26
		10½	264.84

L	B	D	T
118	23	11	277.47
		12	302.69
		13	327.90
		14	353.17
	24	9½	248.60
		10	261.69
		11	287.85
		12	314.6
		13	340.23
		14	366.39
		15	392.56
	25	9½	257.47
		10	271.5
		11	298.15
		12	325.25
		13	352.35
		14	379.45
		15	406.55
	26	9½	266.22
		10	280.24
		11	308.26
		12	336.28
		13	364.31
		14	392.33
		15	420.36
	27	9½	274.81
		10	289.31
		11	318.24
		12	347.18
		13	376.11
		14	405.5
		15	433.94
119	21½	9	216.9
		9½	228.10
		10	240.11
		10½	252.11
		11	264.12
		12	288.13
	22	9	220.48
		9½	232.72
		10	245.1
		10½	257.24
		11	269.48
		12	294.1
	23	9½	241.91
		10	254.66
		10½	267.40
		11	280.15
		12	305.60
		13	331.9

L designates length, B breadth, D depth, and T tons.

L	B	D	T	L	B	D	T	L	B	D	T	L	B	D	T
	23	14	356.54	119	26	13	367.84	120	22	10½	259.65	120	25	11	303.90
	24	9½	251.3			14	396.17			11	272.5			12	331.55
		10	264.24			15	424.46			12	296.75			13	359.20
		11	290.64		27	9½	277.53		23	9½	244.24			14	386.80
		12	317.9			10	292.16			10	257.11			15	414.45
		13	343.50			11	321.36			10½	269.92		26	9½	271.41
		14	369.90			12	350.57			11	282.78			10	285.69
		15	396.36			13	379.77			12	308.51			11	314.28
	25	9½	260.			14	409.3			13	334.23			12	342.82
		10	273.65			15	438.24			14	359.91			13	371.42
		11	301.5	120	21⅓	9	218.13		24	9½	253.41			14	400.1
		12	328.40			9½	230.24			10	266.74			15	428.56
		13	355.75			10	242.36			11	293.43		27	9½	280.24
		14	383.15			10½	254.47			12	320.12			10	295.1
		15	410.50			11	266.58			13	346.77			11	324.48
	26	9½	268.79			12	290.81			14	373.46			12	354.1
		10	282.94		22	9	222.56			15	400.16			13	383.48
		11	311.27			9½	234.91		25	9½	262.47			14	413.1
		12	339.55			10	247.31			10	276.30			15	442.49

NOTE.

If the Breadth, or Depth, of a Double or Single Decked vessel is not stated in the Tables, take the mean between the two nearest breadths, or depths.

Example.—Required the tonnage of a single decked vessel 100 feet long, 22½ feet broad, and 8 feet deep?

By the Tables, a vessel of the above length and depth, and 22 feet wide, contains 160.76 tons, and the nex breadth of a vessel, given in the Tables, of the same length and depth, is 23 feet, and contains 166.90 tons. Now subtracting the lesser number of tons from the greater, dividing the remainder by 2, and adding the quotient to the lesser amount gives 163.63 as the tonnage of a single decked vessel 100 feet long, 8 feet deep, and 22½ feet wide; and so of any other breadth not stated in the Tables.

The same rule is also applicable to all depths of vessels not stated in the Tables. Suppose a vessel is 50 feet long, 16 feet wide, and 6 feet and 1 inch deep, what is her tonnage? Subtract the lesser amount of tonnage (40.78) from the next largest (42.50), divide the remainder by 3, and add the quotient to the lesser amount and it will give 41.40 as the tonnage of a single decked vessel 50 feet long, 16 feet wide, and 6 feet and 1 inch deep; and so of all other depths not stated in the Tables.

L designates length, B breadth, D depth, and T tons.

ADDITIONAL SINGLE DECKED VESSELS

OF EXTRA BREADTHS.

L	B	D	T	L	B	D	T	L	B	D	T	L	B	D	T
101	26	9	210.33	105		10½	262.1	108	27	9	234.77	111		11	296.35
		9½	222.3			11	274.46			9½	247.81			12	323.30
		10	233.69			12	299.42			10	260.86			13	350.24
		10½	245.39		26	9	220.19			10½	273.90		28	9	249.83
		11	257.9			9½	232.41			11	286.94			9½	263.72
		12	280.44			10	244.64			12	313.8			10	277.61
	27	9	216.86			10½	256.86	109	26	9	230.5			11	305.38
		9½	228.91			11	269 13			9½	242.79			12	333.16
		10	241.1			12	293.57			10	255.59			13	360.88
		10½	253.5		27	9	227.13			10½	268.38		29	9	257.14
		11	265.10			9½	239.72			11	281.17			9½	271.41
102		12	289.20			10	252.36			12	306.70			10	285.69
	26	9	212.77			10½	264.94		27	9	237.35			11	314.28
		9½	224.60			11	277.58			9½	250.53			12	342.82
		10	236.44	106		12	302.81			10	263.71	112		13	371.42
		10½	248.27		26	9	222.63			10½	276.88		27	9	245.4
		11	260.10			9½	235.3			11	290.11			9½	258.62
		12	283.71			10	247.39			12	316.47			10	272.26
	27	9	219.44			10½	259.74		28	9	244.54			11	299.47
		9½	231.62			11	272.14			9½	258.15			12	326.69
		10	243.81			12	296.84			10	271.71			13	353.90
		10½	256.4		27	9	229.66			10½	285.31		28	9	252.50
		11	268.22			9½	242.43			11	298.87			9½	266.53
		12	292.59			10	255.21	110		12	326.9			10	280.56
103	26	9	215.26			10½	267.93		26	9	232.49			11	308.61
		9½	227.22			11	280.70			9½	245.41			12	336.67
		10	239.19	107		12	306.25			10	258.34			13	364.72
		10½	251.15		26	9	225.12			10½	271.26		29	9	259.85
		11	263.11			9½	237.60			11	284.18			9½	274.32
		12	287.3			10	250.14			12	310.2			10	288.74
	27	9	222.2			10½	262.62		27	9	239.88			11	317.62
		9½	234.34			11	275.15			9½	253 24			12	346.50
		10	246.66			12	300.16			10	266.56	113		13	375.39
		10½	259.2		27	9	232.24			10½	279.87		28	9½	269.34
		11	271.34			9½	245.15			11	293.23			10	283.51
		12	296.3			10	258.6			12	319.86			10½	297.67
104	26	9	217.70			10½	270.91		28	9	247.21			11	311.84
		9½	229.79			11	283.82			9½	260.91			12	340.23
		10	241.89			12	309.64			10	274.66			13	368.56
		10½	254.3	108	26	9	227.56			10½	288.40		29	9½	277.22
		11	266.12			9½	240.22			11	302.15			10	291.79
		12	290.30			10	252.84	111		12	329.60			10½	306.40
	27	9	224.55			10½	265.50		27	9	242.46			11	321.1
		9½	237.5			11	278.16			9½	255.91			12	350.18
		10	249.51			12	303.43			10	269.41			13	379.36

L designates length, B breadth, D depth, and T tons.

L	B	D	T
113	30	9½	285.
		10	300.
		10½	315.
		11	330.
		12	360.
		13	390.
114	28	9½	272.15
		10	286.46
		11	315.12
		12	343.74
		13	372 40
		14	401.7
	29	9½	280.13
		10	294.84
		10½	309 59
		11	324.35
		12	353.81
		13	383.33
	30	9½	288.
		10	303.15
		10½	318.30
		11	333.45
		12	363.75
		13	394.10
115	28	9½	274.91
		10	289.41
		11	318.35
		12	347.30
		13	376.24
		14	405.19
	29	9½	283.3
		10	297.89
		11	327.69
		12	357.49
		13	387.30
		14	417.10
	30	9½	291.
		10	306.30
		11	336.90
		12	367.55
		13	398.20
		14	428.80
	31	9½	298.79
		10	314.54
		11	346.2
		12	377.45
		13	408.89
		14	440.37
116	28	9½	277.72
		10	292 36
116		11	321.58
		12	350.81
		13	380.8
		14	409.31
	29	9½	285.89
		10	300.94
		11	331.8
		12	361.17
		13	391.27
		14	421.36
	30	9½	294.
		10	309.45
		11	340.40
		12	371.35
		13	402.30
		14	433.25
	31	9½	301.89
		10	317.79
		11	349.58
		12	381.37
		13	413.17
		14	444.91
117	28	9½	280.53
		10	295.31
		11	324.81
		12	354.37
		13	385.87
		14	413.43
	29	9½	288.79
		10	304.4
		11	334.42
		12	364.80
		13	395.24
		14	425.62
	30	9½	297.
		10	312.60
		11	343.85
		12	375.15
		13	406.40
		14	437.65
	31	9½	305.3
		10	321.9
		11	353.19
		12	385.29
		13	417.40
		14	449.50
	32	9½	312.91
		10	329.41
		11	362.35
		12	395.30
117		13	428.24
		14	461.19
118	28	9½	283.34
		10	298.26
		11	328.9
		12	357.88
		13	387.71
		14	417.55
	29	9½	291.70
		10	307.9
		11	337.76
		12	368.48
		13	399.21
		14	429.88
	30	9½	300.
		10	315.75
		11	347.35
		12	378.90
		13	410.50
		14	442.10
	31	9½	308.13
		10	324.34
		11	356.75
		12	389.21
		13	421.63
		14	454.9
	32	9½	316.15
		10	332.76
		11	366.7
		12	399.34
		13	432.60
		14	465.87
119	28	9½	286.15
		10	301.21
		11	331.32
		12	361.44
		13	391.55
		14	421.67
	29	9½	294.60
		10	310.14
		11	341.15
		12	372.16
		13	403.18
		14	434.19
	30	9½	303.
		10	318.90
		11	350.80
		12	382.70
		13	414 60
		14	446.50
119	31	9½	311.22
		10	327.59
		11	360.36
		12	393.13
		13	425.86
		14	458.63
	32	9½	319.34
		10	336.16
		11	369.74
		12	403.38
		13	437.1
		14	470.60
120	28	9½	288.91
		10	304.16
		11	334.55
		12	365.
		13	395.39
		14	425.79
	29	9½	297.51
		10	313.19
		11	344.49
		12	375.79
		13	407.15
		14	438.45
	30	9½	306.
		10	322.10
		11	354.30
		12	386.50
		13	418.70
		14	450.90
	31	9½	314.32
		10	330.84
		11	363.92
		12	397.5
		13	430.14
		14	463.22
		15	496.31
	32	9½	322.53
		10	339.51
		11	373.46
		12	407.42
		13	441.37
		14	475.33
		15	509.29
	33	10	348.6
		11	382.82
		12	417.64
		13	452.45
		14	487.27
		15	522.9

MISCELLANEOUS RULES.

RULE FOR MEASURING THE SCANTLING OF SHIPS OF WAR.

By S. M. POOK, ESQ., *Naval Constructor.*

Multiply the Moulded Breadth of Beam by the following Decimals for Size, in Inches.

For siding of keel multiply by ·42; depth of keel clear of rabbet by ·84, (allowance being made for bottom plank and dead wood); for depth of keelson multiply by ·7; frame for siding by ·28, (moulded square at floor head diminished to half that size at top height, provided that no frames are moulded less than 4 inches or more than 6 1-2 at head); for siding of beams for inches for main deck multiply the length of beam by ·22, and to that product add the square root of the length. To length of beam multiplied by ·22 add square root of length of beam. Main transom, square, multiply moulded beam by ·50.

For upper gun-deck multiply the main-deck beam by ·95; berth-deck by ·85 of gun-deck; spar-deck multiply main by ·8; beams moulded multiplied by ·85 of their siding.

Siding of lodge knees multiplied by ·6 of knees moulded; dagger and hanging do. ·7 do. do.; carlings square ·5 the siding of beam; ledges square ·4 of do. do.; deck plank ·33 of the depth of beam, (provided that no gun-deck plank are less than 3 inches for vessels of war); for bottom plank and ceiling multiply the moulded beam by ·10; for wales and thick stuff multiply 1·4 of bottom plank; coamings sided same as thickness of wales; for cable bitts multiply the beam by ·45; bowsprit bitts by ·4; for breast hooks sided multiply by ·7 of keel; floors in the throats as deep as the siding of the keel.

Depth of mast partners 3-4 of the beam; stantions square 1-2 siding of the beam; catheads sided and moulded same as beam; channels 1-2 inch thicker than the bottom plank; for rudder diameter multiply the moulded beam by ·5 for width.

Length of keel multiplied by ·5, the answer is in inches; stern-post moulded square at the head multiply by ·2 at the heel.

RULE FOR FASTENINGS.

For fastenings of plank multiply their thickness by 7, the square root of which will be their diameter in 8ths; Frame Bolts do. for keelson multiply the siding of keel by ·6, the square root of which will be the diameter of bolts; for Knee Bolts add 1-2 an inch to siding size, and multiply by 6, the square root of which will be the diameter; this also applies to breast hooks; Blunt Bolts to be 2·5 of the thickness of the piece through which they are driven, their length to be multiplied by 2·5, and the square root of the same to be their diameter in 8ths. When the Dead Wood Bolts require to be longer than the average of keelson bolts, multiply their excess of length by 1·5 and add the square of the product to the square of the diameter of keelson bolts, the square root of the sum will be the required size of the bolts. Fore Hatch Coamings multiply their thickness by 10, the square root of which is their diameter. Chains, the strap around the deadeye, length be-

low the deadeye its diameter; Toe-ling 15 to 20 inches long; for diameter of Main Chains multiply the moulded beam by 3·5, the square root of which will be their diameter in 8ths; Bolts 1-8 inch larger; Channel stays, breadth twice the diameter of chains, thickness half the breadth; Deck Stopper Bolts the size of chain cable; for Tiller 1-4 the diameter of the rudder head, inner end ·6 of outer end; for the size of Rudder Pintles multiply the diameter of the rudder by 2, and the answer will be in 8ths.

For size of wire of the ring and eyebolts for Gun-Tackles and Breeching multiply the diameter of shot by ·2, the answer is the diameter in 8ths, the ring to be in the clear of the diameter of the shot.

RULE FOR MEASURING GUN CARRIAGES AND BALLS.

The thickness of the brackets and axletrees should be the diameter of the ball, the size of the bolts to be one-fifth the diameter of the shot. The diameter of a ball may be found by its weight; subtract 1-8 of the weight and multiply the remainder by 8, and extract the cube root of the product. To find the weight by its diameter cube the diameter and divide by 8, and add 1-8 of the product for the weight in pounds.

Lbs.	Diam. ball.	Lbs.	Diam. ball.	Lbs.	Diam. ball.
1	= 1·923	6	= 3·494	24	= 5·546
2	= 2·423	9	= 4·000	32	= 6·106
3	= 2·773	12	= 4·403	36	= 6·350
4	= 3·053	18	= 5·040	42	= 6·684

Ports from centre to centre 2*5* diameters; fore and aft 6½ do., up and down 6 diameter. Sill above deck 3½ diameter.

RULE FOR SIZE OF BOATS FOR SHIPS OF WAR.

For the length of first *launch* multiply the square root of the length of the ship by 2·6; breadth 1-4 of the length. First and second *Cutters* of ships of the line, and first *Cutters* of sloops to be ·9 of launch. Third and fourth *Cutters* of ships of the line, and second *Cutters* of sloops to be ·9 of first cutter. *Quarter*, *Waste*, or *Stern Boats* to be of the same dimensions of the third and fourth cutter of ships of the line, or second cutter of sloops, but lighter built. *Gigs* same as third and fourth cutters.

A Ship of the line has 12 boats; Frigate, 9 do.; Sloop of War, 6 do.; Brig, 5 do.

For Siding of Boat's keel multiply the breadth of beam by ·4 for size in inches; timber sided ·5 of keel; moulded at heel 1·5 of siding; head ·5 of heel thickness of plank; for breadth multiply ·10 for thickness in inches.

Proportional Length of Boats, Oars outboard. For Double Banked Boats 1·25 of breadth of Launch; 1·30 do. of the first Cutter; 1·40 do. of the second Cutter; 1·45 do. of the third Cutter.

For Single Banked Boats, multiply 2·20 of the breadth; fourth Cutter Whale Boat; for Gigs 2·5.

To find the *Weight* of Boats, multiply the square of the breadth by the length, and that product for a Launch, by 2·5; first Cutter, by 1·9; Quarter Boats by 1·0; Second Cutter, by 1·4; Stern Boat by 1·0.—Answer will be in pounds.

RULE TO ESTIMATE THE BUILDING OF U. S. SHIP.

To estimate the number of days' work to build a vessel in the U. States Navy and equip her for sea, ordnance and warrant officers' stores excepted,

multiply the square of the breadth by the length, and that product by 2-5ths of the breadth, and divide by ·100, which may be divided as follows:

For Hull, ·720; Spars, ·054; Sails, ·046; Rigging, ·048; Boats, ·025; Gun Carriages, ·035; Outfits and Sea Stores, ·050; Furniture, ·022.

Four times the number of days will be the whole cost in dollars. For cost of outfits and sea-stores add ·70 per cent.

DISPLACEMENT OF VESSELS.

It is well known that when a body floats on a fluid, it displaces as much of that fluid as is equal in size and form to the portion of the body which is immersed, and the bulk of fluid thus displaced is known to be equivalent in weight to the weight of the whole body; the measure therefore in *solidity* of the portion of the body that is immersed, will give the magnitude of the fluid displaced, and the weight of this bulk of fluid will give the weight of the floating body.

Example.—Suppose a vessel with all its masts, stores and general equipments, is found to displace 35,000 cubic feet of sea-water, what is the whole weight of the vessel?

Sea water average 64 lbs. per cubic foot.

$$35000 \times 64 \div 2240 = 1000 \text{ tons.}$$

To find the Displacement in Tons to Load-line for a Ship of War.

By S. M. POOK, ESQ., *Naval Constructor.*

RULE. — Multiply the length between perpendiculars by the breadth, and that product by 2-5ths of the breadth, and if for a

Schooner,	*divide* by	87·33
Brig,	"	77·62
Sloop of War,	"	69·83
Frigate,	"	63·02
Ship of the Line,	"	58·21

Average for ships of war, ·70.

Example.—The length of a brig between perpendiculars is 100 feet, and her breadth 27 feet, what should be the displacement in tons?

$$100 \times 27 \times 10{\cdot}8 \div 77{\cdot}62 = 375{\cdot}6 \text{ tons.}$$

To find the Displacement, in Feet, of Ships of War.

RULE. — Multiply the length between perpendiculars by the moulded beam, and that product by 2-5ths of the beam, and if for a

Schooner,	*multiply by*	·4
Brig,	"	·45
Sloop,	"	·50
Frigate,	"	·55
Ship of the Line,	"	·60

For tons divide the product by 34·931, which is the number of feet in a ton of 2240 pounds.

Example. — The length of a ship between perpendiculars being 175 feet, and breadth of moulded beam 45 feet, what should be the displacement in feet?

$$175 \times 45 \times 18 \times {\cdot}60 = 85{,}050 \text{ feet.}$$

Another Method to find the Displacement of a Vessel, in Tons.

RULE.—Multiply the mean of the lengths of the keel and between the perpendiculars, by the area of the greatest immersed section in square feet, and *divide* this product, if for a

Frigate, or ordinary Merchantman,	*by*	·43 to ·46
Sloop, or Sea Steamer,	"	·44 or ·45
River Steamer,	"	·46 or ·47

EXAMPLE.—The length of a Sea Steamer being between the perpendiculars 250 feet, length of keel 236 feet, and the area of the midship section below the load-line is 650 square ft.; what should be the displacement in tons?

$250 + 236 \div 2 = 243$. Then $243 \times 650 \div 44.5 = 3549$ tons

NOTE.—The exact displacement is 3535 tons.

Rule for finding the approximate Decimal of a Ship in proportion to a Circumscribing Parallelopipedon.

BY S. M. POOK, ESQ.

From an angle of 90 degrees deduct the angle of the floor of the ship, at one quarter of its breadth, the remainder multiplied by .0075 will give the decimal required.

PROPORTIONS FOR TOPS, TRESTLETREES, CROSS-TREES, AND CAPS.

Old Navy Rule.

Main-top, breadth is 1-2 beam moulded.

Fore-top, breadth is 9-10 of Main-top.

Mizen-top, breadth is 4-5 of fore-top.

Lower Trestletrees, { *length*, length of tops. *depth*, 3-5 mast at partners. *thickness*, 1-2 of depth.

Lower Cross-trees, { *length*, breadth of tops. *breadth*, breadth of trestletrees. *depth*, 2-3 of breadth,

Top-mast Trestletrees, { *length*, 2-5 of length of lower cross-trees. *breadth*, 1-2 breadth of do. do. *depth*, 1-2 depth of do. do.

Length, after, 3-5 of after lower cross-trees of their respective masts.

Topmast Cross-trees, do., *middle*, 5-6 of after one.
do. do. do., *fore*, 5-6 of middle one.
do. do. do. *breadth*, the breadth of their respective trestletrees. Depth or thickness 4-5 of the breadth.

Caps of Bowsprit, { *length*, 4 multiplied by diameter of jib-boom. *breadth*, 1·5 do. do. do. *thickness*, ·5 breadth.

All other Caps, { *length,* 4 multiplied by diameter of respective topmasts or top-gallantmasts.
breadth, 1·5 multiplied by diameter of topmasts, &c.
thickness, ·5 breadth.

The *length* of all Tops must be 2-3 of their *breadth,* and made light, with upper cross-trees upon the top over the lower ones, fayed down on the battens, and well keyed together. The forward quarters of the top should be sufficiently rounded to prevent chafing the sails.

ENGLISH RULE FOR MASTING AND SPARRING VESSELS.

"In determining the masts and yards for merchant ships, no general rule seems to be practised, as we find numerous ships in the same trade, of the same dimensions, and (to appearance) of the same stability, with very dissimilar masts and yards. This in some degree may be accounted for, by the masting and sparring of these ships being often regulated by the opinions of those persons who are to command them, sometimes to the fancy of the owner, and at other times to the builder. This matter of tastes has not only caused a great difference in the dimensions of masts and yards for similar ships, but as great a variety in the tautness of the masts and the squareness of the yards.

"The rules given by different authors for determining the proportion of masts, yards, &c., for merchant ships, are of very little use now, for there are so many varieties in the build of these ships,—some very long and narrow, and others both long and broad, that it is impossible to make one rule serve in both cases; and it would require a great number of rules to determine the proportion of masts and yards, the way at present these ships are rigged. It is not intended to give rules, as it is more common now to delineate a plan of the sails, from dimensions of masts and yards of the most approved rig the same size, or thereabouts, and vary them as may be considered necessary for the trade she is to be employed in, and for the number of men that have to work the sails. This is decidedly the best method to adopt for ships of any kind, as it will be seen upon the plan how the masts and yards look in proportion to the size of the vessel; besides, the calculation of the centre of effort of the sails can easily be found, and compared with other ships that have been known to answer well."

On the Diameters and Forms of Masts, Yards, &c.

"In ascertaining what strength and form should be given to the several spars made use of in masting of ships, so that a proper maintenance may be afforded for resisting the strains that masts, yards, &c., are subject to, we must be guided by our knowledge on the effects produced on the different descriptions of timbers, and by what experience and much service have found to be best, rather than by any speculative theory. It is from observations of this sort that the mast-maker has been enabled to form such a judgment respecting the strength and diameters that are requisite for all masts, yards, &c., and to form rules from experience, as to be pretty correct and easy of application.

"The largest diameter is that which is *given,* and is taken thus:—at the partners or decks of lower masts; at the cap, in top-masts and top-gallant masts; at the bed, of bowsprits; at the slings or middle, of yards; at the bowsprit-cap, of jib-booms; at the middle, of driver-booms; at the sheet or taffrail, of main-sail-booms; at four feet from the end, of gaffs; at one-third from each end of top and top-gallant studding-sail-booms; and, at one-third from the inner-end, of swing or lower studding-sail-booms."

Proportions that the Diameters usually bear to the respective Length of the Masts, Yards, &c.

DIAMETERS OF MASTS.

Main and fore masts, one inch for every three feet of the length.
Main masts of brigs, one inch to every three feet in length; and the fore-mast nine-tenths of the diameter of the main-mast.
Masts of Cutters, three-fourths of an inch in diameter to every three feet in length.
Mizen masts of ships, two-thirds of the diameter of the main-mast.
Main and fore-top masts, one inch to every three feet in length.
Mizen top-masts, seven-tenths of the diameter of the main-top-mast.
Top-gallant-masts, one inch to every three feet in their length.
Royal-masts, two-thirds the diameter of their top-gallant masts.
Bowsprits, the same diameter as the main-mast.

DIAMETERS OF YARDS.

Main and fore-yards, at the slings or middle, seven-tenths to seven-eighths of an inch to every three feet in the length.
Top-sail-yards, five-eighths to seven-eighths of an inch to every three feet in the length.
Top-gallant-yards, six-tenths to five-eighths of an inch to every three feet in the length.
Royal-yards, one-half the diameter of their top-sail yards.
Studding-sail-yards, one inch in diameter to every five feet in the length.

DIAMETERS OF BOOMS.

Studding-sail-booms, one inch to every five feet in the length.
Jib-booms, seven-eighths of an inch to every three feet in the length.
Flying-jib-booms, seven-eighths of an inch to every three feet in the length.
Driver-booms, the same as the fore-top-sail-yard.
Gaffs, the same as their booms.

PLAN FOR MASTING AND SPARRING SHIPS OF WAR IN UNITED STATES NAVY.

By the Board of U. S. Naval Constructors—1843.

For the length of the Main mast × the extreme breadth of ship by 2·30.
For the length of the Fore mast × length of mainmast by ·92.
Mizen-mast 1-3 of the length of the main mast head above underside of main trestletrees; diameters of fore and main masts, length × ·333; diameter of mizen-mast ·7 of main.
Length of Fore and Main topmasts the length of respective lower masts × ·565 for ships of the line, and ·6 for smaller ships.
For length of Mizen topmast, main topmast × ·75. Length of top-gallant masts, topmasts × ·5. Royal masts, top-gallant mast × ·68. Poles, royal masts × ·5. Heads of Lower masts, topmasts × ·29 Topmast heads, top-gallant masts × ·32.
Diameter in inches of Main topmast (on the cap) length × ·307. Fore-topmast same as main; diameter of mizen topmast, length × ·29.
Diameter of Mizen topgallant-mast, length × ·333.
Bowsprit outboard, extreme breadth of ship × ·9; diameter in the bed same as main mast in the partners.

Length of Jib-boom outside of cap, length of bowsprit × ·8; which will include the pole, which is ·06 of the whole length outboard.

Flying Jib-boom, for length outside jib-boom, jib-boom length outside × ·8, and this length × ·19 will give the length of the pole.

Diameter of Jib-boom in inches, whole length outboard × ·53.

Diameter of Flying Jib-boom in inches, whole length outboard including pole × ·43.

For length of Spanker-boom in ships, length between perpendiculars × ·3. Diameter, length × ·23. Length of Spanker-gaff, length of spanker-boom × ·75; and for length of pole deduct ·13 of whole length; for diameter, whole length × ·2.

For Spanker-booms in brigs, the length of main yard.

In the short Sloops, so called, and the Cyanne and the Levant, for yards, length between perpendiculars × ·56.

For Main yard, length between perpendiculars × ·54; arm less × 0·62; diameter × ·235.

Fore Yard, length of main yard ×·92; all yards on the mast by the same.

Cross-jack-yard × ·65 of main; all yards on the mizen by the same.

Main top gallant Yard, main yard × ·475.

Yard-arm Cross-Jack, length × ·055; this applies to top-gallant Yards.

Diameter of Cross Jack, length × ·21.

Mizen top-gallant × ·468 of cross-jack-yard.

Main top, breadth extreme × ·43; for width take 2-3 of width for length.

Fore-top, main-top × ·92.

Depth of Main and Mizen-trestletrees diameters of their topmasts.

Fore-lower-trestletrees, length of main × ·92. Top-trestletrees in depth equal to diameter of their respective top-gallant masts in the caps. Thickness of the trestletrees to be half the depth: length of after top-mast crosstrees take ⅓ of their respective tops, each topmast to have 3 cross-trees.

The length of the Fore mast is to be ascertained by a line parallel to the load-line, commencing at the top of keelson under the mast.

Should the keelson be above this line, at the fore mast, the rise is to be deducted from the length here given. Should the keelson be below the line, the difference between the two is to added to the length here given.

The Diameters of the Partners are the extreme diameters.

PLAN (LATER), FOR MASTING AND SPARRING SHIPS OF WAR IN UNITED STATES NAVY.

[The following Plan is also suitable for the generality of Clipper Ships, and can be proportionally reduced to suit all descriptions of Merchant Vessels]

YARDS.

Main Yard, twice the extreme breadth of beam.

Fore Yard, nine-tenths of main yard.

Cross-Jack Yard, five-sevenths of main yard.

All Topsail-Yards, three-quarters of their respective lower yards.

All Top-gallant Yards, seven-fifteenths of their respective topsail-yards.

All Royal Yards, one-third of their respective lower yards.

All Yard Arms, one-twentieth of the whole length—except topsail-yards, which will be one-eleventh of their length.

MAIN MAST.

Main Mast, from Partners to Hounds, five-sevenths of the main yard—head and depth of hole added.

FOREMAST.

Foremast, Head or Cap to be level two-thirds the mainmast cap or head, from the hounds.

MIZENMAST.

Mizenmast Head or Cap, to be level, one-third the mainmast cap or head, from the hounds.

MAST-HEAD.

Lowermast-Heads, one-third the respective topmasts, exclusive of topmast-heads.

TOPMAST-HEADS.

Topmast-Heads, one-third the respective topgallantmasts.

TOPMASTS.

All Topmasts, two-thirds their respective lower yards.

TOPGALLANTMASTS.

All Topgallantmasts, one-half their respective topmasts.

ROYALMASTS.

All Royalmasts, two-thirds their respective topgallantmasts.

ROYAL-POLES.

All Royal-Poles, two-fifths their respective royalmasts.
BOWSPRIT, outboard, six-sevenths of the breadth of beam
JIB BOOM, three-quarters the length of bowsprit outboard.
FLYING JIB BOOM, one-half the length of the Jib-boom outboard.

DRAWING PLANS FOR CUTTING RIGGING.

The most proper way to ascertain the lengths of all standing and running rigging, is to make a *draft*, or rigging plan of the vessel you are employed upon, drawing it to a scale of reduced proportion to the real dimensions, as the 8th or 4th of an inch to the foot, as may be convenient for the drawing.

To draw the plan of rigging for a new ship, it is necessary to have the dimensions of the hull, as :—

The distance between the foreside of the stem to the centre of the foremast.

The distance between the centre of the foremast to the centre of the mainmast.

The distance between the centre of the mainmast to the centre of the mizenmast.

The distance between the centre of the mizenmast to the outside of the taffrail.

The housing of the foremast.
" " mainmast.
" " mizenmast.

The step of the foremast above a straight line from the step of the mainmast.

The step of the mizenmast ditto. ditto.

The number of inches the foremast rakes to the foot.
" " mainmast "
" " mizenmast "
" " bowsprit rises to the foot.

The height of the rail or gunwale.
" " topgallant forecastle.
" " poop.
" " cathead or bumkins.

Also, the dimensions of masts, yards, gaffs, &c.

ON MEASURING MASTS, YARDS, BOOMS, &c., ON BOARD.

The width of all sails is governed by the length of the yard, gaff, boom, and stay: the depth by the height of the mast. The total extent of either is always taken, and the allowances for the sails stretching are left to the judgment of the sailmaker.

TOPSAILS.

Heads.—The topsail-yards are measured from cleat to cleat on the yard-arms.

Feet.—The fore, main, and cross-jackyards are measured from pin to pin of the sheave-holes.

Hoists.—The topmasts are measured from the hounds down to the heel, and small vessels from the pin-holes down to the heel.

TOPGALLANT-SAILS.

Heads.—The topgallant-yards are measured from cleat to cleat on the yard-arms.

Feet.—The topsail-yards are measured from pin to pin of the sheaves.

Hoists.—The topgallant-masts are measured from the hounds down to the heel.

ROYALS.

Heads.—The royal-yards are measured from cleat to cleat on the yard-arms.

Feet.—The topgallant-yards are measured from pin to pin of the sheaves.

Hoists.—The royal-masts are measured from the hounds down to the heel.

COURSES:—*Fore-Course.*

Head.—The foreyard is measured from cleat to cleat on the yard-arms.

Depth.—The height of the centre of the yard from the deck, and the cat-head above the deck; or, if the yard were sharply braced forward, measure the distance between the place of the earing and the bumkin-end.

BOOM-FORESAIL.

Head.—Measure the length of the foreyard between cleat and cleat.

Foot.—Measure the length of the boom between the two holes.

Depth.—The height of the centre of the yard from the mainstay.

Main-Course.

Head.—The mainyard is measured from cleat to cleat on the yard-arm.

Depth.—The height of the centre of the yard from the deck; or, if the yard were sharply braced forward, the distance from the place of the earing to the chess-tree.

MAIN-STAYSAIL.

Stay.—The length of the mainstay between the mouse and the fore-mast.

Depth.—Measure from the place of the peek plumb down, so that the foot will clear the boat.

TRYSAIL.

Head.—Measure from the inside of the jaws of the gaff to the hounds.

Foot.—Measure the length of the boom from the aftereside of the mast, or from the jaws to the sheave-hole at the end.

Fore-leech.—Measure from the under part of the hounds to the boom, or from the under part of the gaff, hoisted to its proper height, to the boom.

Cross-gore.—The diagonal length is taken from the throat, or height of gaff on the mast, to the place of the clue. This is done to get the proper foot-gore, and, if thought necessary, to make a draft.

FORE-TRYSAIL.

Head.—Measure the length of the gaff.

Foot.—Measure from the mainstay, where it crosses the foremast, to the forepart of the gangway.

Mast.—The height of the gaff stands above the mainstay.

GAFF-TOPSAIL.

Mast.—Measure from the sheave-hole of the topmast, or the place the throat reaches, down to the gaff hoisted to its proper place.

Foot.—Measure the length of the gaff to the hounds.

Cross-gore.—Let the gaff be properly peeked, and measure the distance between the places of the throat and clue.

AWNINGS:—*Forecastle.*

Measure the *length* from the fore-end, or forestay, to the afterside of the foremast.

Breadths.—Measure the distances between the two cat-heads, middleway, and fore-part of fore-rigging. The breadth of the fore-end is generally 3 feet.

MAIN-DECK AWNING.

The *length* is taken from the afterside of foremast to afterside of mainmast.

The *breadths* are taken at the fore-part of fore-rigging and main-rigging.

QUARTER-DECK AWNING.

The *length* is taken from the afterside of the mainmast to the foreside of the mizenmast.

The *breadths* are at the fore-part of main-rigging and mizen-rigging.

POOP, OR AFTER-AWNING.

The *length* is from the foreside of the mizenmast to the rake of the stern over the taffrail.

The *breadths* are at the fore part of mizen rigging and at the taffrail.

CURTAINS TO AWNINGS.

Their depth is taken from the sides of the awning to the gunwale, supposing the awning to be in its place.

SURFACE OF SAILS FOR MERCHANT VESSELS.

The surface of the principal Sails for merchant vessels should be twice the parallelogram of the load-line.

DRAWING PLANS OF SAILS.

Plans of sails are drawn to a scale of reduced proportion to the real dimensions, as the 8th or 4th of an inch to the foot, as may be convenient for the drawing. This sort of drawing is called *geometrical*, because it has no reference to a spectator, and is not designed to give the appearances of the sails *perspectively*, but only purposes to exhibit the form and measurement of the surfaces of the sails in height and breadth, and also for rightly ascertaining the dimensions of the leeches, stays, and total amount of the sweep-gores on the head and foot, &c., of particular sails, as jibs, &c.

The whole of these operations are performed by means of a rule containing a scale of equal parts, a compass, a parallel ruler, and a square.

To draw the plan of sails for a new ship, it is requisite to have the *dimensions of the hull*, as :—

The distance between the foreside of the stem to the centre of the foremast.

The distance between the centre of the foremast to the centre of the mainmast.
The distance between the centre of the mainmast to the centre of the mizenmast.
The distance between the centre of the mizenmast to the outside of the taffrail.
The housing of the foremast.
" " mainmast.
" " mizenmast.
The step of the foremast above a straight line from the step of the mainmast.
The step of the mizenmast above a straight line from the step of the mainmast.
The number of inches the foremast rakes to the foot.
" " " mainmast " "
" " " mizenmast " "
" " " bowsprit rises to the foot.
The height of the rail or gunwale.
" " topgallant forecastle.
" " poop.
" " cathead or bumkins.
Also, the *dimensions of masts, yards, gaffs, &c.*

In order to have a right understanding of draughting sails, geometry ought to be learned; for the art of draughting presents difficulties to persons ignorant of it, which to the geometrician are easily surmounted.

PRACTICAL METHODS OF CONSTRUCTING SAILS.

To draw the plan.—Given the widths of the head and foot, the depth of the middle, the length of the leech.

Head.—Set off half the breadth of the head, from the centre of the mainyard, both ways.

Depth.—Set down, from the centre of the yard, the depth of the middle perpendicularly.

Foot.—Draw a line perpendicular to the depth, and set off from the middle half the width of the foot both ways.

Leeches.—Join the places which are set off for the earings and clues.

MAIN-TOPSAIL.

To draw the plan.—Given the widths of the head and foot, and the height of the middle.

Mast or hoist.—Set down the depth, from the centre of the topsail-yard to the centre of the mainyard, at right angles to both.

Head and foot.—Set off half the widths of the head and foot, from the centre of the yards, both ways.

Leeches.—Join the places set off for the earings and clues.

Close-reef.—Set down from the head half the hoist of the topsail, and between it and the head the other reefs.

Middle-band.—Set down from the lower-reef half the distance between the reef and middle of the foot.

Reef-tackle pendant.—Set down three feet (from a scale of equal parts) below the close-reef on the leeches.

Buntlines.—At one-third the breadth of the foot.

Bowlines.—At one-third the distance between the clue and reef-tackle.

MAIN-TOPGALLANTSAIL.

To draw the plan.—Given the widths of the head and foot, the height of the middle.

Hoist.—Set down the *hoist*, from the centre of the topgallantyard to the centre of the topsailyard, at right angles to both.

Head and foot.—Set off half the widths of the head and foot, from the centre of each of the yards.

Leeches.—Join the places set off for the earings and clues.

MAIN-ROYAL.

To draw the plan.—Given the widths of the head and foot, and the height of the middle.

It is precisely the same way drawn as that of the preceding.

The sails on the fore and mizen masts are likewise drawn in the same manner as those on the mainmast.

ON THE CENTRE OF EFFORT.

Definition. — The point of sail or place in which the whole effort of the wind is supposed to be collected, is commonly called the CENTRE OF EFFORT of the sails; and is the point in which, if a single force were applied equally, and directly opposed to the force of the wind, it would destroy its effect, or produce the same result as when uniformly distributed; or as if, in this point, the centre of a single sail were placed with a surface equal to the sum of the surfaces of all the sails.

It is found in a manner similar to that by which we find the common centre of gravity of several bodies only that we in this case consider the surface in place of the weight or magnitude of the body.

Before the centre of effort of the sails can be obtained, it is necessary to make a plan of the sails, and find the centre of gravity of each sail to obtain the moments.

The sails that are in general placed in the plan of the sails, are those which are most frequently used; in square-rigged vessels, the fore and main courses, fore, main, and mizen topsails, fore, main, and mizen topgallant sails, driver, jib, and sometimes fore-topmost-staysail; and in fore and aft rigged vessels, as cutters, the mainsail, foresail, and jib (the second or third jib is commonly taken, as it is seldom that the first jib is set on a wind.) The whole of these sails may not always be set; nor is the pressure of the wind, when it acts obliquely, and as the sail becomes more pressed, the same on both leeches; but since we obtain the moment of the sails, with a view only to compare with ships in which the quantity of sail is well proportioned to the stability, and in which the position of the point of sail is correct as to length, the unequal effect of the wind, and the number of the sails used (and these the principal sails), being the same in each case, will not affect the comparison.

If sails were rectangular, the centre of gravity of each sail would evidently be the point where its diagonals intersect each other. But since most sails are either trapeziums or triangles, their centre of gravity must be found differently. If two sides of a triangular sail, as the jib, be bisected, and lines drawn from these points to the opposite angles, the intersection of the two lines will be the centre of gravity. The sails that are trapeziums with two equal sides, as the topsails, are formed into two triangles *gqz* and *gqv*, by drawing the diagonal *gq*; the centre of gravity of each triangle is found, as for the jib; a line, *ba*, is drawn through the two centres of gravity, and the point in which it cuts the middle line of the sail, *c*, is its centre of gravity.

When the sail is a trapezium, as the driver, not having two equal surfaces on each side of the middle, it is first divided into two triangles, *azd* and *azg*, by drawing the diagonal *az*; the centres of gravity are found as before, and a line, *hl*, is drawn to pass through them; this figure is then

formed again into two triangles, *dga* and *dgz*, by drawing the diagonal *dg*, from the two other angles *d* and *g*, the centre of gravity of these is found, and a line, *of*, drawn to pass through them; the intersection *m*, of the two lines *of* and *hl*, is the centre of gravity of the sail.

The areas of all the sails that are triangular are found by multiplying the base by half the height, as in obtaining the area of a common triangle; and the area of a trapezium, by forming it into two triangles, obtaining the area of each, and taking the sum of the two. The *moment*, as to height, is obtained by multiplying the height of the centre of gravity of each sail into the area; the sum of the moments of all the sails, divided by the sum of the areas, gives the height of the centre of effort. To obtain the distance of the centre of effort from the middle of the length of the water-line, multiply the distances of the centres of those sails that are before it into their areas, for the sum of the moments before; and the distance of the centres of those that are abaft into their areas, for the sum of those abaft; when, if the difference between the sums of the two moments be divided by the sum of the areas, it will give the place of the centre of effort, either before or abaft the middle, according to which the moment has the excess.—*Fincham.*

AREAS OF SAILS.

The area of the sails is the measure of their surface, or the space contained within the boundaries of that surface, and is estimated by the number of squares contained therein.

The area of a triangle and trapezium is found according to rules in mensuration. Thus:—

I. *For the area of a triangle.*—Multiply the base by the perpendicular height, and half the product will be the area.

II. *For the area of a trapezium.*—Let two perpendiculars be drawn from the opposite angles to the diagonal. Multiply the sum of these perpendiculars by the diagonal, and half the product will give the area.

Jib. [By Rule I.] Perp. 24·6, Stay 76.

Then, 24·666 × 76 = 1874·616 ÷ 2 = 937·3 square feet.

Fore-Course. [By Rule II.]

Perps. 20·5 + 20·5 = 41·0 × Diag. 48·5 = 1988·50 ÷ 2 = 994·25 sq. ft.

Fore-Topsail. [By Rule II.]

Perps. 28 + 20 = 48 × Diag. 49·5 = 2376·0 ÷ 2 = 1188 square feet.

Fore-topgallantsail. [By Rule II.]

Perps. 13 + 17 = 30 × Diag. 34 = 1020 ÷ 2 = 510 square feet.

Main-Course. [By Rule II.]

Perps. 24 + 27 = 51 × Diag. 60 = 3060 ÷ 2 = 1530 square feet.

Main-Topsail. [By Rule II.]

Perps. 22·5 + 31·5 = 54 × Diag. 55·33 = 2987·82 ÷ 2 = 1493·9 square feet

Main-Topgallantsail. [By Rule II.]

Perps. 14 + 18 = 32 × Diag. 37 = 1184 ÷ 2 = 592 square feet.

Driver. [By Rule II.]

Perps. 26 + 20 = 46 × Diag. 42·666 = 1962·6 ÷ 2 = 981·3 square feet.

Mizen-Topsail. (By Rule II.)

Per. 15·3333 + 22·5 = 37·8333 × Diag. 38·5 = 1456·582 ÷ 2 = 728·291 s. f·

Mizen-Topgallantsail. (By Rule II.)

Perps. $10 + 13 = 23 \times$ Diag. $25{\cdot}5 = 586{\cdot}5 \div 2 = 293{\cdot}25$ square feet.

To find the number of *yards* of Canvas in any Sail, ascertain, by the above Rules, the number of Square Feet, then find the number of Square Feet in one yard of the given width, divide the whole number of square feet in the sail by the square feet in one yard and the quotient will be the number of yards of Canvas required.

Ex.—Required the yards of 22 inch canvas in a sail measuring 937 square feet?

$22 \times 36 \div 144 = 5{\cdot}5$ sq. ft. $937 \div 5{\cdot}5 = 170{\cdot}36$ yards.

CENTRE OF EFFORT.

Species of Sails.	*Areas.*	*Moments.*	*Moments before.*	*Moments abaft.*
Jib	937·3333	43117·3333	72643·3333	
Fore-course	994·25	26513·3333	40267·1250	
Fore-topsail	1188·	66924·0000	47916·0000	
F.-topgallantsail ..	510·	43605·0000	20485·0000	
Main-course	1530·	44880·0000	....	13770·
Main-topsail	1494·	93375·0000	....	15687·
M.-topgallantsail..	592·	55944·0000	....	7104·
Driver	981·3333	29930·6666	....	51029·33
Mizen-topsail	728·2916	40541·5694	....	32287·597
M.-topgallantsail..	293·25	23264·5000	....	13489·5
Sum	9248·4582	468095·4027	181311·4583	133367 43

Height of centre of effort above the water-line, $\frac{468095{\cdot}403}{9248{\cdot}4583} = 50{\cdot}61$ ft.

Centre of effort before the middle of water-line, taken from the fore-part of the stem to the after-part of the stern-post, $\frac{181311{\cdot}4583 - 133367{\cdot}43}{9248{\cdot}4583} = 5{\cdot}1.$

Relative proportion of the fore as to the after moments, $\frac{133367{\cdot}43}{181311{\cdot}4583} = {\cdot}73,$ or 1 : ·73.

The determination of the position of the centre of effort by the foregoing rule, is made under the supposition that the sails are plane surfaces; while by the pressure of the wind the whole assume a curved surface, by which the centre of effort is carried farther aft, which in a degree causes the ardency to increase with the force of the wind; and the helm, which may have been a-lee in light winds, may be carried a-weather as the wind increases.

* * * * *

The following rule will always give the place of the centre of effort of the sails, for the ship to answer well; and though it will not agree in all cases with the table from which the several results are selected, yet it will fall within the limits in which ships are found to answer, and will vary with the elements that must affect the mean result, as will be seen by the following

RULE.

Add three-quarters of the distance that the centre of gravity of the vertical longitudinal section is abaft the middle of the water-line, to two-thirds of

the distance that the centre of gravity of displacement is before the said middle; by the sum of which, divide the distance that the centre of gravity of displacement and centre of gravity of the vertical longitudinal section are apart, and the result will give a divisor for dividing one-tenth the length of the load water-line, taken from the fore-part of the stem to the after-part of the stern-post; this last result will give the distance, nearly, that the centre of effort of the sails should be before the centre of gravity of the vertical longitudinal section. In cutters, and in vessels with the fore-and-aft rigging, the effect of the sails is different, and will require an alteration in the rule; in which case, one-tenth the length of the water-line should be divided by the distance between the centre of gravity of displacement and centre of gravity of the vertical longitudinal section, for the distance that the centre of effort is before the latter centre.

Example.—Merchant Ships.

Length of the water line, 165; 165 ÷ 10 = 16·5

Centre of gravity of displacement before the middle, 2·1 feet.

" " vertical longitudinal section abaft the middle . . . . . 3· "

2·3 of 2·1 = 1·4. 3·4 of 3 = 2·25. 2·25 + 1·4 = 3·65.

2·1 + 3 ÷ 3·65 = 1·39. 1·65 + 1·39 = 11 = what the centre of effort of the sails should be before the centre of gravity of the vertical longitudinal section, according to the rule. 3 + 8·3 = 11·3 = what the centre of effort should be according to the table before mentioned, giving a very small error.

* * * * *

In determining the quantity of sail, the length and breadth of ships are the elements commonly used;—the *length* for the length of the yards, or spread of the sails; and the *breadth* for the height of the masts, or depth of the sails. The using of these two elements alone, in determining the quantity of canvas for a ship, may appear to show a want of system, since the form of the body, and the place of the common centre of gravity, may cause the stability of ships of the same length and breadth to be different; but while the relative length and breadth of the ship may make it desirable at times to vary the proportions of the masts to the yards, still the *length* and *breadth* are the *best* elements for obtaining them.

From the masts and yards, determined by the length and breadth of the vessel, we obtain the quantity of canvas, or area of sail, from which the moment of sail is obtained, and compare it with the moment of stability. When these are defined, we have only to bring the moment of sail to the given terms of stability, so that the ship may not exceed a determined inclination, under certain circumstances; or to estimate the moment of stability at the inclination, under the given circumstances, and make the moment of the power of the wind on the sails equal to it.

Example 1.—*Merchant Ships.*

Moment of sails, 1475304: moment of stability at 10° inclination, 1547. Therefore, moment of sails in terms of stability, 1475304 ÷ 1547 = 953.

Example 2.

Moment of sails, 607809; moment of stability at 10° inclination, 864. Therefore, moment of sails in terms of stability, 607809 ÷ 864 = 703.

Example 3.—*Brig.*

Moment of sails, 214132; moment of stability at 10° inclination, 209. Therefore, moment of sails in terms of stability, 214132 ÷ 209 = 1024.

From the experiments made by Lynn, Smeaton, and others, we are able

to compare, by the following Table, the power of the wind on the surface of a square foot, according as the winds are commonly distinguished by seamen; and having this, with the quantity and moment of sails, we can easily obtain the effect that is produced, and what degrees of inclination the ship will make under the different powers of the wind.

POWER OF THE WIND WITH DIFFERENT BREEZES.

Winds, as commonly distinguished.	Power of Winds on a Square Foot.		Sails commonly set by the Wind.
Winds.	*From*	*To*	*Species of Sails.*
	lb.	lb.	
Light airs	·006	·05	Courses, topsails, topgallantsails, royals, spanker, jib, flying-jib, and all light sails.
Light winds	·09	·14	Ditto, do. do. do.
Light Breezes	·20	·27	Ditto, do. do. do.
Moderate breezes	·36	·45	Ditto, do. do. do.
Fresh Breezes	·56	1·27	Royals and flying-jib, taken in, in a seaway, to two reefs in the topsails.
Strong Breezes ..	1·45	2·27	Single-reefed topsails and topgallantsails; in much sea, two reefs in the topsails to taking in topgallantsails.
Moderate gales ...	2·5	3·54	Double-reefed topsails to treble-reefed topsails, reefed spanker and jib.
Fresh gales	3·8	5·10	Close-reefed topsails, reefed courses, to taking in spanker, jib, fore and mizen topsails.
Strong gales	5·44	6·94	Reefed courses, close-reefed main-topsail, fore-staysail, mizen-trysail, to taking in the mainsail.
Heavy gales	7·34	9·0	Close-reefed main-topsail, storm-staysails, to storm-staysails or close-reefed main-topsail only.
Storms	9·53	13·6	

The quantity of sail set, and the power of the wind being known, the product of this power into the moment of sail set, shows the inclining force acting upon a ship under any circumstances whatever; and a comparison of this force with the degrees of stability of the body, will show nearly the angle of inclination which will be produced. When, therefore, it is required to ascertain the quantity of sail which will be necessary and sufficient for any ship, without exceeding the stability of the body, all that is requisite to be done is, to compare the moment of sails in terms of the stability of the ship, with the amount of sails in terms of the stability, as found in the preceding rules; it will then be seen whether the amount of sail is sufficient to propel the ship, without producing any undue inclination.

A FEW OF THE TERMS USED IN SHIP-BUILDING.

LENGTH OF VESSEL (TONNAGE).—The length of every vessel is measured from the fore part of the main stem to the afterside of the stern post above the upper deck.

LENGTH BETWEEN PERPENDICULARS.—From a perpendicular at the height of the upper deck at the fore part of the stem, to a perpendicular

from the intersection of the cross-seam with the rabbet to the base of the sheer, half breadth, &c.

AFTER-PERPENDICULAR.—A line drawn square from the intersection of the cross-seam with the rabbet, to the base of the sheer, half breadth, &c.

BREADTH, MOULDED, to the outside of the frame timbers.

BREADTH, EXTREME, from outside to outside of wales.

SHEER.—The curve or bend of a ship's deck or sides.

LIGHT LOADED WATER LINE.—The line of flotation, when the vessel is launched.

DEEP LOADED WATER LINE.—The line of water when the vessel is at her greatest depth.

CEILING.—The inside plank.

COUNTER.—That part of the stern from the cross seam to the arch board.

CROSS-SEAM.—The lower edge of the Counter.

RABBET.—An angular incision to receive the ends and sides of planks.

BASE LINE.—The upper edge of the rabbet of the keel.

GARBOARD PLANK is the first plank fastened on each side of the keel.

GARBOARD STRAKE is the first range of strake of planks laid on a ship's bottom next the keel.

KEELSON.—The timber within a vessel laid upon the middle of the floor timbers, and exactly over the keel.

DEPTH IN HOLD, measured from the inner edge of the upper side of the timber strake, to the upper side of the lower deck beam.

DEAD-FLAT.—A name given to the frame possessing the greatest capacity.

DEAD RISE.—The height of the end of the floor timbers above the base line,—about two-thirds of the breadth of the vessel.

COAMINGS.—Raised borders around the edges of hatches.

WEIGHT OF WATER.

1	cubic inch	=	·03617	lb.
12	" inches	=	·434	"
1	" foot	=	62·5	lbs
1	" "	=	6·25	Imperial gallons.
1	" "	=	7·50	U. S. gallons.
1·8	" feet	=	112·00	lbs.
35·84	" "	=	2240·00	"
1	Cylindrical inch	=	·02342	"
12	" inches	=	·341	"
1	" foot	=	49·1	"
1	" "	=	5	Imperial gallons.
1	" "	=	6	U. S. gallons.
2·282	" feet	=	112·	lbs.
45·64	" "	=	2240	"
11·2	Imperial gallons	=	112	"
224	Imperial gallons	=	2240	"
13·44	United States gallons	=	112	"
268·8	United States gallons	=	2240	"

Note.— 5 Imperial gallons equal 6 United States gallons. Hence to convert Imperial gallons into United States gallons add *one-fifth* to the former; and to convert United States gallons into Imperial gallons deduct *one-sixth* from the former.

SHEATHING VESSELS WITH COPPER, YELLOW AND ZINC METAL.

It was not until the latter end of the last century that Copper was introduced for covering the immersed portions of ships. This coating of Copper is extended over the whole intended immersed portion of the bottom. It is formed of sheets of copper of 4 feet in length, and 14 inches in breadth, the lower edges of the upper sheets lapping over the upper edges of those below them, and the after end of each sheet lapping over the fore end of the one immediately following it.

Yellow sheathing metal, has been of late generally used, it being less expensive when compared with copper.

Zinc Sheathing, manufactured by La Veille Montagne Zinc Mining Company, of Leige, in France, has lately been introduced for sheathing vessels. It is said to be considerably cheaper than copper, or yellow metal, lasts longer; and many shipmasters certify that it continues as clean as yellow metal.

MODE OF SHEATHING VESSELS.

The Copper, or Metal, used in sheathing vessels is divided into three thicknesses, consisting of twenty, twenty-four, and twenty-eight ounce; but oftener it is equally divided into four thicknesses of twenty-two, twenty-four, twenty-six, and twenty-eight ounce,—and is applied in the following manner:—The twenty-eight ounce should cover the bows diagonally from the fore-mast, at load line, to the heel of the forefoot; the twenty-six ounce should run parallel from the heel of the fore-mast to the main-mast; the twenty-four ounce should run from the heel of the main-mast to the load line at the mizen-mast; and the twenty-two ounce should cover all abaft the mizen-mast, except the rudder, which should be sheathed with twenty-six ounce, the beardings with twenty-eight ounce, and the keel with twenty-six ounce.

To ascertain the quantity of Copper required to sheath a vessel, measure the length of the keel, and find how many sheets it will take to extend the whole length, allowing 3 feet 11 inches for the length of a sheet of copper; then ascertain the number of courses from the

bottom of the keel to the copper-line, allowing 1 foot 1 inch for one course of copper; then multiply the number of courses by the number of sheets on the keel, and the product gives the number of sheets required for each side.

A full built Ship requires about 1-20th more Copper than a Clipper.

Sheets of Copper are usually punched for three and five rows of nails.

The sheets punched with three rows require 39 nails.

The sheets punched with five rows require 49 nails.

EXTERNAL SURFACE OF HULLS OF VESSELS.

To ascertain the Bottom and Side Surface of Vessels of various Classes, exclusive of Keel, &c.

By S. M. POOK, ESQ., *Naval Constructor.*

RULE. — Multiply the moulded breadth by the length between the perpendiculars, double that sum, and multiply by the following decimals, to obtain the square feet.

Schooner, *very sharp*, . .	·560
Brig, ...	·573
Sloop of War, ...	·586
Frigate, ...	·600
Ship of the Line, . . .	·613

The product will be the surface of the bottom, exclusive of the keel, stem, and post, to the load-line.

Example.—Suppose the length of a vessel between perpendiculars is 150 feet, and moulded breadth 30 feet, what is the surface in sq. ft.?

$$150 \times 30 \times 2 \times \cdot 586 = 5{,}274 \text{ sq. feet.}$$

In estimating the amount of Copper to cover the bottom and sides of a vessel, add 25 per cent for keel, stem, post and rudder, and one strake above the load line.

A sheet of Copper covers 4·333 feet square.

Though no two vessels of the same tonnage can be sheathed with the same number of sheets of Copper, — one vessel having a thirty inch depth of keel and another ten inch,— one having a dead rise of thirty-five inches and another being dead flat, presenting a greater surface to cover; — yet, the Merchant and Shipwright will find the following Tables useful assistants, to approximate to the quantity of metal required to sheath vessels of similar form and tonnage.

SHEATHING VESSELS WITH COPPER.

TABLE SHOWING THE NUMBER OF SHEETS OF COPPER, USED IN SHEATHING VESSELS.

[Prepared for this Work by Capt. S. B. Hobart, Superintendent of late Marine Railway, Boston, Mass.]

Names of Vessels.	Tons.	Copper Line. Forward.	Aft.	Dead Rise.	Length of Keel.	Breadth of Beam.	Whole No. of Sheets.
Argo,	450	12½	13½	12	120	30	1350
Amos Patten,	250	10½	11½	6	90	25	759
Ariosto,	361	11	11½	10	120	28	1000
Arcatus,	548	14	15	14	133	30½	1325
Adrian,	578	12	13	6	140	31	1250
Aldebaran,	880	15	16	14			1187
Admittance,	426	15	15½	16	122	28	1150
Amity,	500	13	14	4	125	30	1282
Attica,	349	9	9	9	110	27	920
Arkansas,	400	10½	11	6	120	29½	1001
Arab,	498	15½	16	10	127	32	1500
Anna Rich,	737	12	12½	13	146	34	1437
Annawan,	759	13	13½	4	144	33½	1561
Brighton,	837	Bends.		6	100	27	1050
Baltic,*	300	9	10	7	100	28	767
Brontes,	291	10	11	9	100	28	950
B. Aymar,	434	10	11	12½	119	28½	1000
Brutus,	550	11½	12½	5	126	30	1420
Broosa,	415	8	9	10	115	28	918
Cyprus,	199	8	9	12	90	25	623
Calumet,	316	Bends.		6	100	28	937
Cowper,	391	9	9½	9	110	28	783
Cato,	464	11½	12	6	120	29	1340
Colombo,	577	11½	12½	9	132	32	1269
Coromando,	635	16	17	8	132	32½	1540
Cherokee,	411	10	11½	9	110	28	900
Carthage,	430	13½	14	8	125	28	1222
Charlotte,	540	Bends.		9	131	31	1540
Camera,	380	9½	10	6	100	29	923
Concordia,	603	Bends.		6	132	32½	1441
Charles,	487	11	11½	12	117	29	1265
Carbos,	325	7½	8	4	100	27	650
Coquette,	457	11	15	35	110	31	1160
Columbiana,	630	11½	12	6	130	32½	1320
Chusan,	240	9	10	6	80	24	725
Chile,	569	Bends.		8	130	32	1409
Chasca,	658	Bends.		9	132	32½	1374
Capitol,	687	Bends.		5	140	32	1646
Deucalion,	513	10½	11	12	130	30	1110
Dover,	430	Bends.		12	110	28	1156

* This vessel was coppered with 107 sheets of 18 ounces, 280 do of 20 oz., 260 do. of 22 oz., and 120 do. of 24 ounces.

Names of Vessels.	Tons.	Copper Line. Forward.	Aft.	Dead Rise.	Length of Keel.	Breadth of Beam.	Whole No. of Sheets.
Dragon,	290	11	11½	12	105	25	847
Dan Sharp,	533	Bends.		15	124	30	1334
Emily Taylor,	388	10½	11	9	116	29	1050
Edward Everett,	622	13½	14½	8	130	31½	1500
Fred. Warren,	363	Bends.		6	124	24	1372
Franklin,	431	Bends.		12	125	31	1130
Farwell,	698	13½	14	8	135	32	1500
Fearless,	643	16	17-	11	141	31½	1534
Franconia,	499	11	11½	9	122	31	1146
Flavio,	630	11½	12	6	132	32	1255
Gen. Taylor,	597	14	15	15	134	32½	1510
Gem of Ocean,	702	17½	18	4	146	33	1558
Huron,	514	12	13	16	125	30½	1200
Herculean,	549	10½	11	12	125	31½	1063
Isaac Newton,	600	11½	12	2	130	31	1200
Kentucky,	492	10	11	5	125	30	1090
Lenox,	370	12⅛	13	8	110	27	1045
Lochenvar,	635	12	13	8	134	32½	1282
Loo Choo,	640	15	15½	19	135	32½	1580
Massasoit,	390	13	14	0	110	28	1020
Medora,	314	12	12½	8	118	26	950
Mary Francis,	326	12	13	6	100	26	900
Moscow,	277	10	11	6	90	25	736
Merlin,	313	10	10½	15	100	27	835
Maria Theresa,	229	13	14	2	95	26	725
Marathon,	382	12	13	6	118	28	1113
Milton,	597	12	12½	8	132	32	1280
Moselle,	398	11½	12½	5	118	27	1048
Mindora,	285	Bends.		6	95	25	750
Medora,	479	13	14	16	115	29	1135
Manchester,	291	11½	12	15	124	31½	1130
Monsoon,	380	8½	9½	12	115	28	810
Macedonia,	415	11	11½	5	117	28	1084
Malabar,	548	12	13	12	132	33	1384
Monterey,	422	10½	11	6	100	25	932
Manlius,	670	Bends.		12	146	33	1257
Medford,	545	11½	12	9	125	28	1281
Magellan,	557	Bends.		17	146	31	1460
Mountain Wave,	633	16	16½	13	141	32½	1614
Nantasket,	435	Bends.		6	125	28	1400
Newburyport,	347	11	12	10	110	25	1060
New England,	357	Bends.		6	106	25	1200
Natches,	296	10	11	10	110	25	750
Norman,	508	14	15	6	125	28	1350
Norfolk,	543	11	12	6	130	30	1075
Neptune,	498	10½	11	6	122	29	1050
North Carolina,	669	Bends.		12	136	32½	1610
Nisida Stewart,	565	11½	12	8	124	30½	1111
Oleanus,	473	11	12	12	100	30	1011

Names of Vessels.	Tons.	Copper Line. Forward.	Aft.	Dead Rise.	Length of Keel.	Breadth of Beam.	Whole No. of Sheets.
Orlando,	436	10½	11	4	125	29	1025
Olga,	332	12½	13	6	100	26	950
Oyando,	300	10	10½	5	100	25	814
Ork,	244	7½	8½	6	90	24	602
Parthenon,	535	9	11	6	130	32½	1200
Plymouth,	425	Bends.		10	120	29	1330
Potomac,	272	10	11	12	90	25	814
Pontiac,	538	Bends.		10	128	32	1547
Peterhoff,	494	11½	12½	14	122	30	1050
Roscius,	303	Bends.		16	100	28	900
Robin Hood,	395	Bends.		15	110	26	1125
Russian,	222	9½	10½	9	90	24	600
Rosabella,	234	9	10½	16	100	27	700
Riga,	345	9½	10	10	100	27	812
Rob Pulsford,	406	Bends.		14	110	28	1025
Rochall,	644	11	11½	5	136	32½	1313
Rubicon,	487	11½	12	12	120	30	1200
Rajah,	531	16	16½	10	133	31½	1100
Rowland,	411	10½	11	6	112	28	926
Reindeer,	800	14½	15½	13	145	35	1575
Rambler,	400	Bends.		6	110	28	1289
Rajah Wallee,	700	8½	10½	32	161	26	1536
Revere,	734	Bends.		15	146	34	1530
R D. Shephard,	790	11½	12	10	153	33½	1505
Statesman,	672	11½	12½	11	132	32½	1300
Sweden,	646	12	12½	8	136	32½	1371
Sachem,	717	11½	12	8	148	33½	1454
Siam,	727	Bends.		13	144	33	1834
Soldan,	648	12	12½	6	134	32	1405
T. B. Wales,	598	12	12½	13½	131	34	1304
Victory,	669	17	18	12	145	32	1700

SHEATHING VESSELS WITH COPPER.

Prepared by CAPTAIN BARSTOW, Superintendent of East Boston Dry Dock.

Names of Vessels.	Tons.	Copper Line. Forward.	Aft.	Dead Rise.	Length of Keel.	Whole No. of Sheets.
Columbia,	600	15	15½	13	138	1630
Edwin Forrest,	1200	16	17	22	173	2156
E. Foster,	977	17	18	20	163	2350
E. Maria,	768	12	12½	15	140	1396
Flying Fish,	1505	18	19	20	190	2556
Lexington,	841	13	14	17	165	1512
Lady Franklin,	511	18	15	15	113	1258
Morning Light,	1800	20	20½	21	205	2795
Mary Robinson,	1372	17½	18	14	176	2509
Northern Light,	1100	16	16½	26	170	1852
Osburn Howes,	1000	15	16	17	176	1665
Old Dominion,	618	11½	12	18	138	1237

Names of Vessels.	Tons.	Copper Line. Forward.	Aft.	Dead Rise.	Length of Keel.	Whole No. of Sheets.
Queen of the Pacific.	1356	19	20	18	189	2570
Robin Hood,	1182	16	17	18	175	1985
Spitfire,	1600	19	20	15	192	2440
Starr King,	1170	20	20	16	169	2146
Sierra Nevada,	2000	18½	19	13	209	2730
Star of Empire,	2050	15	15½	13	180	2310
S. Leonard,	500	10	11	16	133	1000
S. America,	837	16	16½	19	161	1861
Sea Lion,	563	10½	11½	18	129	1101
Winged Arrow,	1052	17	18	20	170	2450
Winged Racer,	1767	19	20	26	193	2693
Western Continent	1272	15	16	17	188	1812
Wild Rover,	1100	17½	18½	19	177	2196
Witch of the Wave.	1499	18½	19½	42	192	2310
Whistler,	942	20	21	24	166	2500

NAILS, COPPER BOLTS, SPIKES, SHEATHING COPPER, &c., Sold by H. N. Hooper & Co., 58 Commercial St., Boston.

NUMBER OF COMPOSITION SHEATHING NAILS IN A POUND.

(By actual count.)

Size.	Number.	Size.	Number.	Size.	Number.
⅞ to a lb. . .	230	1⅛ to a lb. . .	186	1⅜ to a lb. . .	112
1 " . .	190	1¼ " . .	169	1½ " . .	105

Size.	Weight of Copper Bolts per Foot.	Number of Composition Spikes to the 100 lbs.		
½	lbs. ·7567	5	inch. round head,	500
⅝	· · 1·1824	5	· · square, · ·	434
¾	· · 1·7027	5½	· · · · · ·	400
⅞	· · 2·3176	6	· · · · · ·	377
1	· · 3·0270	6½	· · · · · ·	295
1⅛	· · 3·8312	7	· · · · · ·	275
1¼	· · 4·7298	7½	· · · · · ·	210
		8	· · · · · ·	200
		8½	· · · · · ·	140

WEIGHT OF SHEATHING COPPER, AND YELLOW SHEATHING METAL, PER SHEET.

Size.	Lb.	oz.	Size.	Lb.	oz.	Size.	Lb.	oz.
14 oz.	4	1	20 oz.	5	13	26 oz.	7	9
16 "	4	10	22 "	6	7	28 "	8	3
18 "	5	4	24 "	7		30 "	8	12
						32 "	9	5

THE COST OF COPPER, YELLOW METAL, AND ZINC SHEATHING COMPARED.

Vessel of 400 *Tons.*

COPPER, LASTING 4 YEARS.

1140 sheets, 14 by 48 inches.

570 sheets of 24 oz per square foot		3990 lbs.
285 " 26 " "		2036 "
285 " 28 " "		2327 "
1140		8353 lbs
8353 lbs, at 21 cents	$	1754.13
855 " copper nails, at 21 cents.		179.55
	$	1933.68
Interest, at 6 per cent, for 4 years..		464.08
	$	2397.76
Add half, to make it equal to 6 years.		1198.88
	$	3596.64
Deduct value of 4604 lbs. old copper sheets and nails (half the original weight) at 17 cents per lb..	$	782.68
Net cost after 6 years.....	$	2813.96

YELLOW METAL, LASTING 3 YEARS.

1140 sheets, 14 by 48 inches.

570 sheets of 20 oz per square foot		3325 lbs
285 " 22 " "		1829 "
285 " 24 " "		1995 "
1140		7149 lbs
7149 lbs, at 18 cents	$	1286.82
855 " cast composition nails, at 18c		153.90
	$	1440.72
Interest, at 6 per cent, for 3 years..		259.33
	$	1700.05
Double it, to make it equal to 6 years		1700.05
	$	3400.10
Deduct value of 4002 lbs old metal sheets and nails (half the original weight) at 10 cents per lb..	$	400.20
Net cost after 6 years.....	$	2999.90

ZINC, LASTING 6 YEARS.

1140 sheets, 14 by 48 inches.

570 sheets of 24 oz per square foot		3990 lbs
285 " 26 1-5 " "		2173 "
285 " 30 1-2 " "		2530 "
1140		8693 lbs
8693 lbs, at 7 cents	$	608.51
760 " zinc nails, at 16 cents....		121.60
	$	730.11
Interest, at 6 per cent, for 6 years..		262.84
	$	992.95
Deduct value of 4726 lbs old zinc sheets and nails (half the original weight) at 2 1-2 cents per lb.	$	118.15
Net cost after 6 years.....	$	874.80

Expense per annum with { COPPER..... $ 468.99 / YELLOW METAL 499.98 / ZINC..... 145.80 }

Saving per annum by using Zinc instead of { COPPER ....$323.19 / YEL. METAL 354.18 }

AGENTS.—F. Milliroux, General Agent, 2 Hanover Street, New York; McCall & Strong, New York; Atkinson, Rollins & Co., Boston; N. Trotter & Co., Philadelphia; William & H. McKim, Baltimore; Slark, Day & Stauffer, New Orleans.

CHAINS AND ANCHORS.

Wood Brothers obtained the Prize Medal for Chain Cables at the Great Exhibition of all Nations, held in London, 1851. Stores—George Wood & Co., London; Henry Wood & Co., Liverpool.

Trotman's & Porter's Patent Anchors (Wood Bro's Manufacturers) were found to possess the greatest holding powers by 40 per cent. at the Anchor Trials of all Nations at H.M.Dock Yards, May to Octob'r, 1852.

CHAINS AND ANCHORS.

TABLE I.

Showing the Size and Lengths of Cables and Weight of Anchors required for Classing Ships agreeable to Lloyd's Regulations; also, the attested Proof of Studded and Short Link Chains. — Manufactured by Henry Wood & Co., Liverpool, and George Wood & Co., London.

Vessels Register Tonnage.	Size of CHAINS.	Lengths required.	ANCHORS. Wood Stock.	ANCHORS. Iron Stock.	ANCHORS REQUIRED. B. S. K.	Attested Proof on Chain. Size.	Studded.	Short Link.
	Inch.	Fathoms	Cwt.	Cwt.		ins.	Tons.	Tons.
50	$\frac{3}{4}$ & $\frac{11}{16}$	100	3	4	2 0 1	$\frac{5}{8}$	$6\frac{1}{2}$	5
70	$\frac{13}{16}$ " $\frac{3}{4}$	120	4	5	2 0 1	$\frac{11}{16}$	$7\frac{1}{2}$	$5\frac{3}{4}$
90	$\frac{15}{16}$ " $\frac{7}{8}$	130	5	6	2 0 1	$\frac{3}{4}$	9	$6\frac{3}{4}$
100	1 " $1\frac{1}{16}$	150	$5\frac{1}{2}$	7	2 0 1	$\frac{13}{16}$	$10\frac{1}{2}$	$7\frac{3}{4}$
130	1	150	$6\frac{1}{2}$	8	2 0 2	$\frac{7}{8}$	$12\frac{1}{2}$	9
160	$1\frac{1}{8}$ & 1	180	$8\frac{1}{2}$	10	2 1 2	$\frac{15}{16}$	14	$10\frac{1}{2}$
200	$1\frac{1}{8}$	180	11	13	2 1 2	1	16	12
250	$1\frac{1}{4}$ & $1\frac{1}{8}$	200	13	15	2 1 2	$1\frac{1}{16}$	18	14
300	$1\frac{1}{4}$	200	15	$17\frac{1}{2}$	3 1 2	$1\frac{1}{8}$	$20\frac{1}{2}$	16
350	$1\frac{3}{8}$ & $1\frac{1}{4}$	240	17	$19\frac{1}{2}$	3 1 2	$1\frac{3}{16}$	$22\frac{1}{2}$	18
400	$1\frac{3}{8}$	240	19	22	3 1 2	$1\frac{1}{4}$	25	$20\frac{1}{2}$
500	$1\frac{1}{2}$	270	$22\frac{1}{2}$	$26\frac{1}{2}$	3 1 2	$1\frac{5}{16}$	$27\frac{1}{2}$	$22\frac{1}{2}$
600	$1\frac{5}{8}$ & $1\frac{1}{2}$	270	26	30	3 1 2	$1\frac{3}{8}$	$30\frac{1}{2}$	25
700	$1\frac{5}{8}$	300	29	34	3 1 2	$1\frac{7}{16}$	$32\frac{1}{2}$	$27\frac{1}{2}$
800	$1\frac{3}{4}$ & $1\frac{5}{8}$	300	31	36	3 1 3	$1\frac{1}{2}$	36	30
900	$1\frac{3}{4}$	300	33	39	3 1 3	$1\frac{5}{8}$	$42\frac{1}{2}$	36
1000	$1\frac{7}{8}$ & $1\frac{3}{4}$	300	35	41	3 1 3	$1\frac{3}{4}$	49	42
1100	$1\frac{7}{8}$	300	37	44	3 1 3	$1\frac{7}{8}$	$52\frac{1}{2}$	49
1200	2 & $1\frac{7}{8}$	300	40	46	3 1 3	2	56	54
1500	2	300	45	52	3 1 3	$2\frac{1}{8}$	62	
2000	$2\frac{1}{8}$ & $2\frac{1}{4}$	300	50	60	3 1 3	$2\frac{1}{4}$	68	

A Stream Chain Cable is required for all vessels larger than 150 tons register. — It is also recommended that all vessels should have from 45 to 75 fathoms Mooring Chain. — A little variation in the weight of the Chains may occur, as Iron is sometimes rolled full, or otherwise. Trotman's & Porter's Patent Anchors will answer of less weight than any others. — A Certificate of the attested proof will be given with each cable, which must be produced to Lloyd's surveyors before any vessel can be classed.

CHAINS AND ANCHORS.

TABLE II.

Showing the size of Chains and Anchors, required for Vessels according to their Register Tonnage. (For Low Decked Vessels add 1-5 to the Tonnage.) Warranted for two years, provided the size of the Chain conforms to the tonnage of the vessel as specified in the Table. Manufactured and sold by Cotton, Hill & Co., 105 State Street, Boston.

Ships Tonnage.	Size of Chain.	Wht. pr. Fathom.	Proof.	Size of Anchor.
			Tons.	
30	Inch. $\frac{1}{2}$	lbs. 14	4	lbs. 150
50	" $\frac{9}{16}$	" 18	$5\frac{1}{2}$	" 200
75	" $\frac{5}{8}$	" 22	7	" 300
100	" $\frac{11}{16}$	" 27	8	" 400
120	" $\frac{3}{4}$	" 32	10	" 500
140	" $\frac{13}{16}$	" 38	12	" 600
160	" $\frac{7}{8}$	" 44	14	" 700
180	" $\frac{15}{16}$	" 50	16	" 800
200	" 1	" 56	19	" 900
240	" $1\frac{1}{16}$	" 63	22	" 1100
280	" $1\frac{1}{8}$	" 70	25	" 1300
320	" $1\frac{3}{16}$	" 78	28	" 1450
360	" $1\frac{1}{4}$	" 86	31	" 1600
400	" $1\frac{5}{16}$	" 95	34	" 1750
440	" $1\frac{3}{8}$	" 105	38	" 1900
500	" $1\frac{7}{16}$	" 115	41	" 2100
550	" $1\frac{1}{2}$	" 125	44	" 2300
600	" $1\frac{9}{16}$	" 136	47	" 2500
700	" $1\frac{5}{8}$	" 145	50	" 2700

A TABLE SHOWING THE WEIGHT OF CHAIN CABLE.

150 Fathoms of	$2\frac{1}{4}$ inch	Weighs	45,249	pounds.
150 "	$2\frac{1}{8}$ "	"	37,400	"
150 "	2 "	"	37,372	"
150 "	$1\frac{15}{16}$ "	"	34,125	"
150 "	$1\frac{7}{8}$ "	"	32,225	"
150 "	$1\frac{3}{4}$ "	"	27,192	"
150 "	$1\frac{11}{16}$ "	"	25,350	"
150 "	$1\frac{5}{8}$ "	"	23,934	"
150 "	$1\frac{3}{4}$ "	"	17,204	"
150 "	$1\frac{1}{4}$ "	"	14,384	"
150 "	$1\frac{1}{8}$ "	"	11,921	"

CHAINS, CABLES, AND ANCHORS.

TABLE III.

Showing the size of Cables and Anchors proportioned to the Tonnage of Vessels. By Pow & Fawcus, Chain Cable and Anchor Manufacturers, London. This Table is the result of very considerable experience, and shows the proportion of Chain when substituted for Rope, the weight per fathom and the proof strain. Also the weight of Anchors to correspond with the Cables and the Register Tonnage of Vessels.

Register Tonnage	Size of Chain.	lbs. per Fathom.	Size of Rope.	Proof Tons.	Weight of Anchors.
5	$\frac{5}{16}$	$5\frac{1}{2}$	$2\frac{1}{2}$	$\frac{3}{4}$	
8	$\frac{3}{8}$	8	$3\frac{1}{4}$	$1\frac{1}{2}$	
10	$\frac{7}{16}$	11	4	$2\frac{1}{2}$	Cwt.
20	$\frac{1}{2}$	14	$4\frac{3}{4}$	$3\frac{1}{2}$	2
30	$\frac{9}{16}$	18	$5\frac{1}{2}$	$4\frac{1}{2}$	$2\frac{1}{2}$
40	$\frac{5}{8}$	24	$6\frac{1}{4}$	6	3
50	$\frac{11}{16}$	28	7	$7\frac{1}{2}$	$3\frac{1}{2}$
60	$\frac{3}{4}$	32	$7\frac{3}{4}$	9	4
75	$\frac{13}{16}$	38	$8\frac{1}{2}$	11	$4\frac{1}{2}$
95	$\frac{7}{8}$	44	$9\frac{1}{4}$	13	$5\frac{1}{2}$
120	$\frac{15}{16}$	50	10	15	$6\frac{1}{2}$
150	1	56	$10\frac{3}{4}$	17	8
180	$1\frac{1}{16}$	63	$11\frac{1}{4}$	19	$9\frac{1}{2}$
210	$1\frac{1}{8}$	71	12	$21\frac{1}{2}$	11
240	$1\frac{3}{16}$	79	$12\frac{3}{4}$	24	$12\frac{1}{2}$
280	$1\frac{1}{4}$	88	$13\frac{1}{2}$	27	14
320	$1\frac{5}{16}$	96	$14\frac{1}{2}$	30	$15\frac{1}{2}$
360	$1\frac{3}{8}$	106	15	33	17
400	$1\frac{7}{16}$	115	$15\frac{1}{2}$	36	$18\frac{1}{2}$
450	$1\frac{1}{2}$	125	16	40	20
550	$1\frac{5}{8}$	145	$17\frac{1}{4}$	48	25
700	$1\frac{3}{4}$	170	$18\frac{1}{2}$	56	30
850	$1\frac{7}{8}$	195	20	64	37
1000	2	230	22	72	45

BREAKING WEIGHT OF ROPE.

The breaking weight of a good hemp rope is 6400 lbs. per square inch, but in the practical application of absolute strength, no cordage should be subjected to a strain or weight above one-third of its estimated value.

Manilla rope is about half as strong as hemp.

IRON CHAINS AND HEMP ROPES.

A first class United States ship of the line has three chains 2¼ inches diameter, and 180 fathoms in length, and anchors of 9,000 pound weight. In the merchant service fewer and shorter chains are used than in the naval, hence heavier chains are necessary.

A modern clipper built ship requires chains and anchors of less size and weight than the full built ship of the same tonnage.

An English first rate of 120 guns, 2609 tons, has three cables of 25 inches circumference, and four chain cables of 2¼ inches diameter in links, and four anchors of 4 tons 19 cwt.

An 84 of 2284 tons, has three cables of 23½ inches circumference, four 2¼ inch chains, and four anchors of 4 tons 5 cwt. each.

A 50 gun frigate, of 2082 tons, has three 21½ inch cables, four 2 inch chains, and four anchors of 3 tons 10 cwt. each.

A 42 gun ship, of 1084 tons, has three 18½ inch cables, three 1¾ inch chains, and four anchors of 47 cwt. each.

A 26 gun ship of 913 tons, has three 17 inch cables, three 1⅝ inch chains, and 4 anchors of 38 cwt. each.

An 18 gun ship, of 462 tons, has one 14 inch cable, three 1⅜ inch chains, and four anchors of 23 cwt. each.

To ascertain the Strength of Cables, multiply the square of the circumference in inches by 120,— as follows:

$$10 \times 10 \times 120 = 12000 \text{ pounds.}$$

To ascertain the Strength of Ropes, multiply the square of the circumference by 200,— as follows:

$$6 \times 6 \times 200 = 7200 \text{ pounds.}$$

COMPARATIVE STRENGTH BETWEEN CHAINS AND HEMP ROPES

Size of the Chains.	Weight in lb. per fathom.	Proof Strain in tons.	Size of Rope.	Weight of Rope in lb. per fathom.
5/16	6	3/4	2½	1½
3/8	8½	1½	3¼	2½
7/16	11	2½	4	3¾
½	14	3½	4¾	5
9/16	18	4½	5½	7
⅝	24	5¼	6¼	8½
11/16	28	6½	7	10½
¾	32	7¾	7½	12
13/16	36	9¼	8¼	15
⅞	44	10¾	9	17½
15/16	50	12½	9½	19½
1	56	14	10	22

NOTE.—One-eighth of an inch of iron in diameter is more than equal to an inch of hemp rope in circumference.

RIGGERS' TABLES.

[The following Tables are taken from WEALE's Rudimentary Treatise on Rigging.—London Edition.]

CORDAGE TABLE,* SHOWING THE WEIGHT OF ONE FATHOM OF ROPE, FROM 1 INCH TO 24 INCHES INCLUSIVE, PLAIN LAID THREE-STRAND, SUCH AS USED FOR RUNNING RIGGING, ETC.

Size of Rope in inches.	Weight per fathom. lb. oz.	Size of Rope in inches.	Weight per fathom. lb. oz.	Size of Rope in inches.	Weight per fathom. lb. oz.
1	0 3¾	6¼	9 0	11½	30 9
1¼	0 5¾	6½	9 11¾	11¾	31 14
1½	0 8¼	6¾	10 8	12	33 3
1¾	0 11¼	7	11 4⅘	12¼	34 9½
2	0 14¾	7¼	12 2	12½	36 0
2¼	1 2⅘	7½	13 0⅗	12¾	37 8
2½	1 7	7¾	13 13⅖	13	38 15
2¾	1 11⅞	8	14 12⅓	13¼	40 8¼
3	2 1⅕	8¼	15 11½	13½	42 0
3¼	2 7	8½	16 10½	13¾	43 9¼
3½	2 13⅕	8¾	17 10½	14	45 4¾
3¾	3 2⅘	9	18 10⅖	15	52 0⅓
4	3 11	9¼	19 11⅘	16	59 5
4¼	4 1⅗	9½	20 13⅗	17	66 10
4½	4 10⅔	9¾	21 14⅔	18	74 10
4¾	5 3⅘	10	23 1½	19	83 2
5	5 12¼	10¼	24 3½	20	92 11
5¼	6 5⅔	10½	25 7	21	102 1
5½	7 0	10¾	26 11⅘	22	112 0
5¾	7 9⅞	11	27 14½	23	122 3
6	8 4¾	11¼	29 1¼	24	134 6

* *Rule to find the Weight of any sized Rope.*—A rope of 1 inch circumference requires 486 fathoms to make one hundred weight. The superficial part of all circles being in proportion to the square of their diameters, consequently the square of their circumference. Therefore a rope of 1 inch in circumference, whose square is one, has 486 fathoms to a cwt ; and, therefore, 486 being divided by the square of the circumference of any rope, the quotient will give the number of fathoms. For instance—

$$9 \times 9 = 81) \overline{486} \text{ (6 the number of fathoms in a cwt.}$$
$$\underline{486}$$

Rule to find the Weight of 120 fathoms of any sized Cable.—Multiply the circumference by the circumference and divide the product by 4, and the quotient will be the number of cwt. in 120 fathoms.

5 per cent. added to 3 strand rope makes it equal in weight to 4 strand.

A TABLE SHOWING THE WEIGHT OF 100 FATHOMS OF CABLE LAID ROPE, FROM 2 TO 24 INCHES. ALSO A COMPARATIVE SIZE OF CHAIN.

Size.	Threads.	Weight. cwt.	qr.	lb.	Chain Equal.	Size.	Threads.	Weight. cwt.	qr.	lb.	Chain Equal.
2	27		3	26	..	13½	954	35	0	7	1¼
2½	36	1	1	8	..	14	1026	37	2	24	..
3	54	1	3	25	..	14½	1098	40	1	12	1⅜
3½	72	2	2	16	..	15	1170	43	0	1	..
4	99	3	1	6	⅜	15½	1251	45	3	26	1½
4½	108	3	3	24	..	16	1332	48	3	24	..
5	135	4	3	23	..	16½	1413	51	3	21	..
5½	162	5	3	22	..	17	1503	55	1	0	1⅝
6	189	6	3	21	..	17½	1593	58	2	6	..
6½	216	7	3	21	..	18	1683	61	3	13	1¾
7	252	9	1	1	..	18½	1782	65	2	1	..
7½	288	10	2	9	..	19	1881	69	0	17	1⅞
8	336	12	0	26	½	19½	1980	72	3	4	..
8½	378	13	3	15	..	20	2088	76	3	1	..
9	423	15	2	25	..	20½	2187	80	1	16	..
9½	468	17	0	22	⅝	21	2295	84	1	14	2
10	522	19	0	21	1	21½	2403	88	1	10	..
10½	576	21	0	19	1	22	2520	92	2	16	..
11	630	23	0	18	.	22½	2646	97	1	3	..
11½	684	25	0	15	1⅛	23	2763	101	2	8	2⅛
12	747	27	1	23	1⅛	23½	2880	105	3	14	..
12½	810	29	3	3	..	24	3006	110	2	1	2⅛
13	882	32	1	19	..						

A TABLE SHOWING THE STRENGTH OF PLAIN-LAID ROPE OF THREE STRANDS.

Size.	No. of Yarns in a Rope.	Weight of 100 fathms. in lb.	Breaking Strain in tons Maximum.	Minimum.	Mean.	Size.	No. of Yarns in a Rope.	Weight of 100 fathms. in lb.	Breaking Strain in tons Maximum.	Minimum.	Mean.
12	1173	2940	45·5	35·	40·	5	204	..	8·2	6·1	7·2
11½	1077	..	41·7	32·	36·7	4½	168	413	6·7	5·	5·9
11	987	..	38·2	29·3	33·6	4	132	..	5·3	4·	4·7
10½	900	..	34·9	26·7	30·7	3½	102	..	4·1	3·2	3·7
10	816	2136	31·7	24·2	27·9	3	75	203	3·1	2·4	2·8
9½	738	..	28·6	21·8	25·2	2½	54	..	2·2	1·8	2·1
9	660	1712	25·7	19·6	22·6	2	33	..	1·5	1·3	1·4
8½	591	..	23·	17·5	20·2	1¾	27	..	1 28	1·13	1·23
8	522	1379	20·4	15 5	18·	1½	21	..	·90	·86	·88
7½	459	..	18·	13·6	15·8	1¼	15	..	·60	·53	·56
7	399	..	15·8	11·8	13·8	1	12	.	58	·46	·51
6½	345	..	13·7	10·2	12·	¾	9	..	·51	·42	·46
6	294	834	11 75	8 7	10·3	½	6	..	·28	·28	·28
5½	249	712	9·8	7·3	8 7						

Short Round-Linked Bobstay, Bowsprit-Shroud or Crane-Chain, without Studs, for Rigging, etc.

Size.	Weight of 100 Fathoms in lbs	Breaking Strain in tons. Maximum.	Breaking Strain in tons. Minimum.	Mean.	Required Test of Strength.	Size.	Weight of 100 Fathoms in lbs	Breaking Strain in tons. Maximum.	Breaking Strain in tons. Minimum.	Mean.	Required Test of Strength.
1 5-8	15,569	75.	68.	73.	31.6	13-16	4,000	20.9	20.	20.4	7.9
1 1-2	.....	64.	58.2	62.3	27.	3-4	3,449	17.8	16.6	17.3	6.8
1 7-16	.....	59.	53.8	57.4	24.7	11-16	2,900	14.9	13.5	14.6	5.6
1 3-8	.....	54.2	49.6	52.8	22.6	5-8	2,538	12.3	10.8	12.	4.6
1 5-16	.....	47.7	45.5	48.4	20.6	9-16	2,001	10.	8.7	9.7	3.8
1 1-4	.....	45.3	41.7	44.1	18.8	1-2	1,583	7.9	6.9	7.7	3.
1 3-16	.....	41.2	38.	40.1	17.	7-16	1,060	6.	5.2	5.9	2.3
1 1-8	7,481	37.3	34.5	36.3	15.3	3-8	827	4.4	3.8	4.3	1.6
1 1-16	.....	33.6	31.2	32.7	13.6	5-16	581	3.	2.7	3.	1.1
1	6,490	30.1	28.1	29.3	12.	1-4	392	1.9	1.7	1.9	.75
15-16	5,600	26.8	25.2	26.1	10.5	3-16	....	1.1	.97	1.	.42
7-8	4,500	23.7	22.5	23.1	9.1						

Comparative Size, Weight, and Strength between Wire Ropes and Hemp Ropes for Standing Rigging.

Hemp Rope. Circumference.	Hemp Rope. Pound Weight per fath.	Wire Rope of equal strength. Circumference.	Wire Rope of equal strength. Pound Weight per fath.	Wire Rope of equal strength. Breakl'g Strain.	Wire Rope of equal strength. Work'g Load.	Hemp Rope. Circumference.	Hemp Rope. Pound Weight per fath.	Wire Rope of equal strength. Circumference.	Wire Rope of equal strength. Pound Weight per fath.	Wire Rope of equal strength. Breakl'g Strain.	Wire Rope of equal strength. Work'g Load.
				tons.	cwt.					tons.	cwt.
2¾	2	1	1	2	6	7	12	2⅞	7	14	42
		1¼	1½	3	9			3	7½	15	45
3¾	4	1⅝	2	4	12	7½	14	3⅛	8	16	48
		1¾	2½	5	15			3¼	8½	17	51
4½	5	1⅞	3	6	18	8	16	3⅜	9	18	54
		2	3½	7	21			3⅜	9½	19	57
5½	7	2⅛	4	8	24	8½	18	3½	10	20	60
		2¼	4½	9	27			3⅝	11	22	66
6	9	2⅜	5	10	30	9½	22	3¾	12	24	72
		2½	5½	11	33			3⅞	13	26	78
6½	10	2⅝	6	12	36	10	26	4	14	28	84
		2¾	6½	13	39						

A Table of the Weight of Tarred Cordage.

Hawsers of 130 fathoms. Size.	Weight pr. 130 fms. each. cwt.	qr.	lb.	Size.	Weight pr. 130 fms. each. cwt.	qr.	lb.
Ins.				Ins.			
6½	13	1	11	3	2	3	20
6	11	1	13	2½	2	0	5
5½	9	2	2	2	1	1	6
5	7	3	19	1½	0	3	13
4½	6	1	22	1	0	1	20
4	5	0	14	¾	0	1	4
3½	3	3	7				

Hawsers of 120 fathoms. Size.	Weight pr. 120 fms. each. cwt.	qr.	lb.	Size.	Weight pr. 120 fms. each. cwt.	qr.	lb.
Ins.				Ins.			
9½	22	2	9	5½	7	3	7
9	20	1	17	5	6	2	1
8½	18	0	26	4½	5	0	23
8	16	0	6	4	4	0	18
7½	13	3	16	3½	3	1	22
7	12	0	18	3	2	2	11
6½	10	1	19	2½	1	3	0
6	9	0	12	2	1	1	4

TABLE SHOWING THE WEIGHT OF TEN FATHOMS OF CABLE-LAID ROPES.

Size in Inches.	Weight. lbs.	oz.	Size in Inches.	Weight. lbs.	oz.	Size in Inches.	Weight. lbs.	oz.	Size in Inches.	Weight. lbs.	oz.
1	2	2	5	54		9	174	15	13	365	
1¼	4	1	5¼	59	8	9¼	184	13	13¼	379	3
1½	3	6	5½	65	5	9½	194	15	13½	393	10
1¾	6	9	5¾	71	6	9¾	205	5	13¾	408	6
2	8	10	6	77	12	10	216		14	423	5
2¼	10	14	6¼	84	6	10¼	226	14	15	486	
2½	13	8	6½	91	4	10½	238	2	16	552	15
2¾	16	5	6¾	98	6	10¾	249	9	17	624	3
3	19	7	7	106	2	11	261	5	18	699	13
3¼	22	13	7¼	113	8	11¼	273	6	19	779	12
3½	26	7	7½	121	8	11½	285	10	20	864	
3¾	30	6	7¾	129	11	11¾	298	3	21	952	8
4	34	8	8	138	3	12	311		22	1045	7
4¼	39	0	8¼	147		12¼	324	2	23	1142	10
4½	43	11	8½	156		12½	337	8	24	1244	2
4¾	48	11	8¾	165	6	12¾	351	2			

To ascertain the weight of one foot of *Cable-laid Rope*, multiply the square of the circumference by ·036.

TABLE SHOWING THE WEIGHT OF TEN FATHOMS OF TARRED ROPES AND CABLES.

Size in Inches.	Weight. lbs.	oz.	Size in Inches.	Weight. lbs.	oz.	Size in Inches.	Weight. lbs.	oz.	Size in Inches.	Weight. lbs.	oz.
1	2	5	5	59	1	9	191	11	13	399	14
1¼	3	10	5¼	65	3	9¼	202	6	13¼	415	6
1½	5	5	5½	71	8	9½	213	8	13½	431	4
1¾	7	3	5¾	78	3	9¾	224	14	13¾	447	6
2	9	7	6	85	3	10	236	9	14	463	12
2¼	11	15	6¼	92	6	10¼	248	9	15	532	8
2½	14	12	6½	99	14	10½	260	14	16	605	12
2¾	17	12	6¾	107	12	10¾	273	6	17	683	14
3	21	4	7	115	14	11	286	4	18	766	12
3¼	24	14	7¼	124	4	11¼	299	8	19	854	4
3½	28	14	7½	133	3	11½	312	14	20	946	9
3¾	33	3	7¾	142	1	11¾	326	11	21	1043	11
4	37	12	8	151	6	12	340	12	22	1145	6
4¼	42	11	8¼	161		12¼	355	1	23	1251	14
4½	47	14	8½	170	14	12½	369	11	24	1363	3
4¾	53	4	8¾	181	1	12¾	384	11			

To ascertain the weight of a fathom of *Tarred Ropes and Cables*, multiply the square of the circumference by 2·13 and divide by 9. Or, multiply the square of the circumference by ·04, and the product is the weight of a foot.

WEIGHT IN FATHOMS OF AMERICAN CORDAGE AND MANILLA.

Weight of 95 Fathoms of Tarred Cordage.

Size.	Weight.	Size.	Weight.	Size.	Weight.	Size.	Weight.
Inch.	Lbs. Ozs.	Inch.	Lbs. Ozs.	Inch.	Lbs. Ozs.	Inch.	Lbs. Ozs.
1	23 12	3¼	334	6½	1003 7	9½	2032 2
1¼	37 2	4	380	6¾	1082 2	9¾	2143 7
1½	53 7	4¼	429	7	1163 12	9¾	2257 12
1¾	72 12	4½	481	7¼	1248 6	10	2375
2	95	4¾	535 14	7½	1336	10¼	2495 4
2¼	120 4	5	593 12	7¾	1426 8	10½	2618 7
2½	148 7	5¼	654 10	8	1520	10¾	2744 10
2¾	179 10	5½	718 7	8¼	1616 8	11	2873 12
3	213 12	5¾	785 4	8½	1716	11¼	3005 14
3¼	250 13	6	855	8¾	1818 6	11½	3141
3½	291	6¼	927 12	9	1923 12	12	3420

Multiply the Size by the Size and divide by 4.

Weight of 95 Fathoms Tarred Hawser, or Manilla Rope.

Size.	Weight.	Size.	Weight.	Size.	Weight.	Size.	Weight.
Inch.	Lbs. Ozs.	Inch.	Lbs. Ozs.	Inch.	Lbs. Ozs.	Inch.	Lbs. Ozs.
1	19	3¼	267 3	6½	802 12	9½	1625 11
1¼	29 11	4	304	6¾	865 11	9½	1714 12
1½	42 12	4¼	343 3	7	931	9¾	1806 3
1¾	58 3	4½	384 12	7¼	998 11	10	1900
2	76	4¾	428 11	7½	1068 12	10¼	1996 3
2¼	96 3	5	475	7¾	1141 3	10½	2094 12
2½	118 12	5¼	523 11	8	1216	10¾	2195 11
2¾	143 11	5½	574 12	8¼	1293 3	11	2299
3	171	5¾	628 3	8½	1372 12	11¼	2404 11
3¼	200 11	6	684	8¾	1454 11	11½	2512 12
3½	232 12	6¼	742 3	9	1539	12	2736

Multiply the Size by the Size and divide by 5.

Weight of 95 Fathoms of Hawser-Laid Manilla.

Size.	Weight.	Size.	Weight.	Size.	Weight.	Size.	Weight.
Inch.	Lbs. Ozs.	Inch.	Lbs. Ozs.	Inch.	Lbs. Ozs.	Inch.	Lbs. Ozs.
1	15 13	3¼	222 10	6½	669	9¼	1354 12
1¼	24 12	4	253 5	6¾	721 6	9½	1429
1½	35 10	4¼	286	7	775 13	9¾	1505 2
1¾	48 8	4½	320 10	7¼	832 4	10	1583 5
2	63 5	4¾	357 4	7½	890 10	10¼	1663 8
2¼	80 2	5	395 13	7¾	951	10½	1745 10
2½	99	5¼	436 6	8	1013 5	10¾	1829 12
2¾	119 12	5½	479	8¼	1077 10	11	1915 13
3	142 8	5¾	523 8	8½	1144	11¼	2003 14
3¼	167 4	6	570	8¾	1212 4	11½	2094
3½	194	6¼	618 8	9	1282 8	12	2280

Multiply the Size by the Size and divide by 6.

APPLICATION OF THE FOREGOING TABLES.

To obtain the weight of any number of fathoms, divide the pounds in 95 fathoms by 95, and multiply the quotient by the number required.

Ex. Required the pounds in 6 fathoms of 3 inch Tarred Cordage?

95) 213.75 (2.25
×6

13.50 lbs. — 13 lbs. 8 ozs.

NOTE.—The same description of rope, of similar length and circumference, will sometimes vary in weight; this may arise from one rope being a little smaller or larger than represented, or one rope may be harder laid than another, or have been laid with a less quantity or an excess of tar.

WEIGHT A HEMP CABLE WILL BEAR WITH SAFETY.

To ascertain the Strength of Cables.—Multiply the square of the circumference in inches by 120, and it gives the weight the cable will bear in pounds.

Circumference.	Pounds.	Circumference.	Pounds.	Circumference.	Pounds.
6.	4320.	10.25	12607.5	14.50	25230.
6.25	4687.5	10.50	13230.	14.75	26107.5
6.50	5070.	10.75	13867.5	15.	27000.
6.75	5467.5	11.	14520.	15.25	27907.5
7.	5880.	11.25	15187.5	15.50	28830.
7.25	6307.5	11.50	15870.	15.75	29767.5
7.50	6750.	11.75	16567.5	16.	30720.
7.75	7207.5	12.	17280.	16.25	31687.5
8.	7680.	12.25	18007.5	16.50	32670.
8.25	8167.5	12.50	18750.	16.75	33667.5
8.50	8670.	12.75	19507.5	17.	34680.
8.75	9187.5	13.	20280.	17.25	35707.5
9.	9720.	13.25	21067.5	17.50	36750.
9.25	10267.5	13.50	21870.	17.75	37807.5
9.50	10830.	13.75	22687.5	18.	38880.
9.75	11407.5	14.	23520.	18.25	39967.5
10.	12000.	14.25	24367.5		

WEIGHT A HEMP ROPE WILL BEAR WITH SAFETY.

To ascertain the Strength of Ropes.—Multiply the square of the circumference in inches by 200, and it gives the weight the rope will bear in pounds.

Circumference.	Pounds.	Circumference.	Pounds.	Circumference.	Pounds.
1.	200.	3.50	2450.	6.	7200.
1.25	312.5	3.75	2812.5	6.25	7812.5
1.50	450.	4.	3200.	6.50	8450.
1.75	612.5	4.25	3612.5	6.75	9112.5
2.	800.	4.50	4050.	7.	9800.
2.25	1012.5	4.75	4512.5	7.25	10512.5
2.50	1250.	5.	5000.	7.50	11250.
2.75	1512.5	5.25	5512.5	7.75	12012.5
3.	1800.	5.50	6050.	8.	12800.
3.25	2112.5	5.75	6612.5		

NOTE. — See Table Decimals equivalent to the Fractional parts of a Pound.

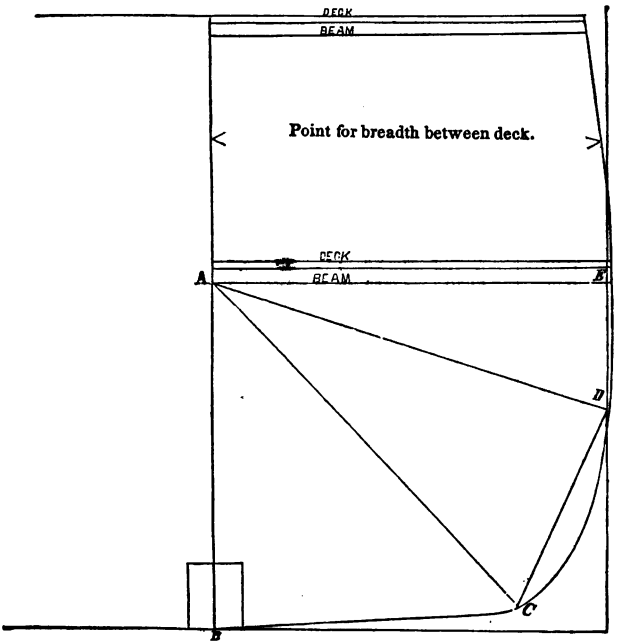
TONNAGE OF VESSELS.

RULE TO FIND THE INTERIOR CAPACITY OF SHIPS.

By S. H. Poor, *Naval Architect.*

Rule. — Get the inside form of the midship section thus: hold the point of the tape line at the centre of the ship at point A, which is the lower side of the lower deck. Then, by Fig. 1, measure, first, to point B, next to C, to D and E; then take the distance from point B to C, C to D, D to E, on the skin of the ship, and you have three right angles, of which calculate the area as usual, and thus obtain the *half* area* of midship section below deck.

Fig. 1.



Now, there is generally from 40 to 60 feet or more nearly straight, in freighting ships. Suppose the ship is 120 feet long, then, by Fig. 2, from A to B is 60 feet nearly straight. Multiply the whole area of the section just found by 60, which will give the cubic

* To find the area of a Triangle or any other figure, see *Mensuration.*

contents of the central part below deck. Now, divide the parts before and abaft of A and B into *five* equal sections. The less the distance the more accurate the result. Measure the sections as in fig. 1, and calculate the area of each section separately, then take *half* the area of B, *add* whole area of C, whole area of D, whole area of E, whole area of F, and *half* of area of last section, which is the stem, and multiply the sum by the number of sections, and you have the the cubic contents of the part before B. Proceed in the same manner *aft*, and obtain the cubic contents of the part *aft* of A. Now make allowance for beams, knees, &c. or any projections in the space calculated.

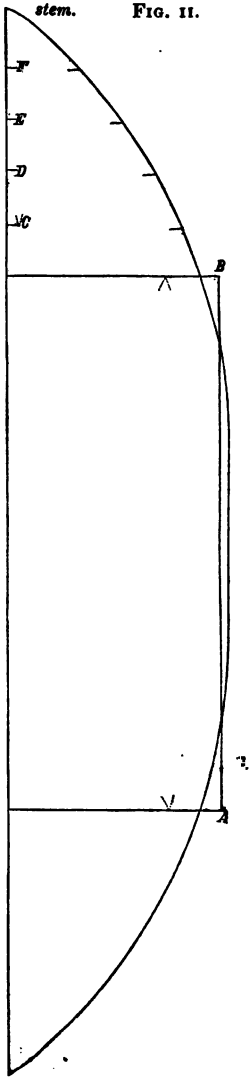


FIG. II.

For the *cubic contents* between decks, take the midship part as long as will not alter over 8 to 12 inches in curvature. Multiply this length by the mean breadth, taken at half the height between decks, and this product by the perpendicular height between decks, for cubic capacity of midship part. Then, for the ends, divide the length into 3 or more parts; breadth taken at one half the height between decks on each section, Take one half the first breadth, all of the second, all of the third, &c., and half of the last, being stem or stern post, add these breadths together, and multiply the sum by the common distance between the points taken, and the product by the perpendicular height between decks gives the solid contents of the part measured.

Now add the 3 *products* and we have the cubic capacity between decks.

Beams, knees, tanks, masts, locks, &c. to be deducted, when projecting into the space calculated.

In this way may be obtained the interior capacity of ships, near enough for all commercial purposes.

TONNAGE.

The tonnage of a Ship, is properly an expression for its interior capacity by the number of tons of sea-water which it could contain; therefore, if the *interior* of a ship were found in *cubic feet*, on dividing the whole number by 35 (the number of cubic feet of sea-water equal in weight to one ton), the quotient would be the Tonnage required.

RULE FOR ASCERTAINING THE DISPLACEMENT OF VESSELS, AND THEREBY THEIR TONNAGE.

By S. M. Poox, *Esq., U. S. Naval Constructor.*

Rule.—From 90° deduct the angle of the floor, or the degrees of dead rise; multiply by .0075, the product is the decimal for displacement; then multiply the length by the breadth, and that product by the depth, from the bottom of the garboard to the load-line, and the last product by the decimal of displacement, and divide by 35,—the quotient is the displacement in tons.

Thus, assuming a ship 150 feet long, 30 feet wide, and from the bottom of the garboard to load-line 15 feet deep, with 4 degrees of dead rise, thus,—

90°	150	ft. long.
4°	30	ft. wide.
86°	4500	
.0075	15	ft. deep.
430	22500	
602	4500	
.6450	67500	
	.6450	decimal of displacement.
	3375000	
	270000	
	405000	
	35) 43537.5000 (1243·92	tons.

After the displacement has been found, the capacity of the vessel is obtained by multiplying the length between perpendiculars by the breadth, and that product by the depth from base to load-line, and this last product being divided into the whole displacement, the quotient will give the actual decimal of displacement.

Then by taking the mean Length, Breadth and Depth inside, and multiply by this decimal just found, we have the actual capacity for tonnage in cubic feet,—divided by 40 cubic feet per ton, and we have the tonnage capacity.

PROPOSED METHOD FOR OBTAINING THE TONNAGE OF A VESSEL.

"The best method to ascertain the tonnage, (exact carrying capacity) of a vessel, would be, that the draught of water of the vessel when she is fully equipped and stored for sea, but without cargo in her, should be taken, when the difference between the displacements of water by the mean draught of water of the vessel, when light, and that when loaded (be it what it may) will be the actual amount of tonnage, or burthen, the vessel has carried."

"When the vessel has her cargo on board, the draught of water can be taken previously to her breaking bulk, and also, after the vessel has been fully discharged of her burthen, the difference between the mean draughts of water of these two immersions, or those arising from adding (in each case) the draught of water forward to that of aft, and taking the half thereof, will give the rising of the vessel bodily in the water in feet and inches; and it is not difficult at half way of that immersion to calculate from the ship the area of the level section of her, and equally easy to find the capacity due to an inch of immersion at that line. As this latter would form the average capacity of the vessel to an inch immersion the whole lading or weight would be tolerably accurately given by reducing into inches the difference shown in feet and inches between the mean draught of water when loaded, and that when the cargo is discharged, and multiplying the result by the capacity per inch."—*Eng. Treatise on Shipbuilding.*

"A single example will serve to make the matter quite clear: suppose a ship to displace 1,000 tons, or 35,000 cubic feet of water at her launching line of flotation, and that she gains 50 tons or 1,750 cubic feet of displacement for every three inches above that launching line; we will again suppose that she is loaded 8 feet above the launching line, which would equal 32 of the three inch spaces—we then have 32 multiplied by 50 equal to 1,600 tons as the burthen of the vessel, her total displacement being 2,600 tons, and 1,000 tons deducted for the weight of the hull. If the vessel should be loaded deeper, the tonnage would, of course, be increased; and this rule of displacement will apply universally to vessels of every form and of every size. If it should be thought best to make allowance for the engines on steam vessels, the weight might readily be determined in the same manner, and the reduction registered. It may be well to remark, that 35 cubic feet of salt water are equal to one ton; this would cover such freight as is called dead weight; for lighter goods, 40 should be the divisor, inasmuch as 40 cubic feet of measurement goods are only equal to one ton of displacement."—*Nautical Mag., New York.*

ENGLISH RULE TO FIND THE TONNAGE OF VESSELS.

Rule.—Divide the length of the upper deck between the after part of the stern and the fore part of the stern-post into 6 equal parts.

Measure the depths from the under side of the deck to the ceiling of the limber strake at the foremost, middle, and aftermost of these divisions.

Add the foremost and after one to twice the midship one, and call it *Sum of the Depths*. Divide each of these three depths into 5 equal parts, and measure the inside breadth at 1-5 and 4-5 from the top of the extreme ones, and at 2-5 and 4-5 of the middle one.

Add together the upper and lower breadths at the foremost division; three times the upper breadth, and the lower breadth of the midship division, and the upper and twice the lower breadth of the after division—call this the *Sum of the Breadths*.

Measure the inside length of the ship at half the midship depth, this will be the *Length*; then

$$\text{Register tonnage} = \frac{\text{Sum of Depths} \times \text{Sum of Breadths} \times \text{Length}}{3500}.$$

If the vessel have a poop or half deck, measure the inside length, breadth and height of each inside the bulkhead, and multiply them together; then divide by 92·4, and the quotient will be the number of tons to be added to the above.

For Open Vessels.—The depths are to be taken from the upper edge of the upper strake.

For Steam Vessels.—The tonnage due to the engine-room is deducted from the total tonnage calculated by the above rule.

To determine this, measure the inside length of the engine-room from the foremost to the aftermost bulkhead; then multiply the length by the midship depth of the vessel, and the product by the inside midship breadth at 0·40 of the depth from the deck, and divide the final product by 92·4.

Vessels whose tonnage is required when their cargoes are on board, must be measured thus: — Measure first the length on the upper deck, between the after-part of the stem and the forepart of the stern-post; secondly, the inside breadth on the under-side of the upper-deck, at the middle point of the length; and, thirdly, the depth from the under-side of the upper-deck, down the pump-well to the skin; multiply these three dimensions together, and divide the product by 130; the quotient will be the amount of registered tonnage.

FREIGHT TABLES.

The following Tables give the *Weight* of various descriptions of *Goods proportioned in Stowage.* After a ship has been measured, and her capacity in Cubic Feet ascertained, it will not be difficult, with the assistance of these Tables, to calculate with tolerable accuracy, her stowage capacity for various kinds of Goods.

EXAMPLE.

If the capacity of a vessel is found to be 294 tons, how many barrels of Flour will she stow?

Answer. As 140 barrels of Flour (weighing 13.750 tons gross) occupy a space equal to 850 cubic feet, then 1960 barrels (weighing 202.5 tons) will occupy a space equal to 294 cubic tons, or about 7 barrels to a ton.

As 8.330 tons of New Orleans (compressed) Cotton occupy a space equal to 850 cubic feet, then a ship measuring 630 tons capacity will stow 249.9 tons of New Orleans compressed Cotton; and so of Tar, Sugar, Rice, Tobacco, Hemp, Wool, and every other article of merchandise.

GOODS PROPORTIONED IN STOWAGE.

The following Table is from "*Harrison's Freighters' Guide*," London Edition, 1848. The 1st column shows the Quantities, in Numbers and Decimal parts; the 2d column the character, or kind of Goods; the 3d column the Gross Weight of the Goods in Tons and Decimal parts of a ton; and the 4th column the number of Cubic Feet required for Stowing the same. [850 *Cubic Feet equals* 21.2 *Tons, or* 1 *Keel.*]

Quantities in Numbers & Decimals.	Articles of Freight.	Tons Weight.	Cubic Feet.
* 97.	Quarters of Wheat, 61.2 lbs. per Bushel equal	21.2	850
88.	do. Tares, Beans, & Peas 63 do. do.	20.	do.
105.	do. Rye, . . . 57 do. do.	21.	do.
108.	do. Seed, . . 52 do. do.	20.	do.
114.	do. Barley, . . . 52 do. do.	21.	do.
125.	do. Oats, . . 37 do. do.	16.5	do.
10.	Tons Clean Hemp and Flax, . . do.	10.	do.
9.107	do. Outshot do. do. . . do.	9.107	do.
7.760	do. Half-clean do. do. . . do.	7.76	do.
5.825	do. Codilla do. do. . . do.	5.825	do.
4.444	do. Wool, ... do.	4.444	do.
5.257	do. Wool, compressed, . . . do.	5 257	do.
7.2727	do. Dried Skins, ... do.	7.2727	do.
17.	do. Tallow, ...		
17.	do. Ashes, ... do.	17.	do.
17.	do. Hides, (salted), . . .		
17.	Loads of Timber, (Baltic squared Fir), .	18.5	do.
17.	do. do. (N American do.), do.	13.5	do.
17.	do. do. (Birch do.) . .	22.	do.
14.923	do. Masts, (round), . . . do.	17.5	do.
	Pieces. Ft. In. In.		
5.1515	Stand. Hund. Deals, 120 12 11 1½ do.	17.	do.
4.857	do. do. Battens. 120 12 7 2½ do.	17.75	do.
1.275	Mille Baltic Staves reduced, . .		
	Viz. 1200 *pieces, 66 in. long by* 1½ *thick,*		
1.300	do. Odessa do. do. . .		
1.200	do. Quebec do. do. . .		
0.840	do. Baltic Staves rough. . . .		
	1200 *pieces* 72 *inches by* 3½, .		
† 0.708	do. Odessa do. do. . . do.	15.25	do.
	1200 *pieces* 76 *inches by* 3½. .		
1.054	do. Quebec do. do. . . .		
	1200 *pieces* 66 *inches by* 2¾, .		
3.885	do. West India do. do. . .		
	1200 *pieces* 42 *inches by* 1¼, .		
80.	Casks Pot and Pearl Ashes, . . do.	16.	do.
8.	Tons Bones (calcined,) in Bulk, . do.	8.	do.
12.	do. do. (manure, &c.,) do. . . do.	12.	do.
16.	do. do. (best quality,) do. . do.	16.	do.

* Wheat is the standard, 8 imperial bushels of Wheat equal 1 Quarter, and 1 English Quarter contains 8¼ United States bushels

† The Staves average 6 inches in breadth.

Quantities in Numbers & Decimals.	Articles of Freight.		Tons. Weight.	Cubic Feet.
9.444	Tons Mats of 400 pieces, (Archangel), equal		8.5	850
100.	Barrels Tar . . . . do.	do.	16.	do.
100.	do. Pitch . . . . do.	do.	20.	do.
100.	do. Tar . . . . (Stockholm),	do.	16.	do.
136.	do. Tar and Rosin . (American),	do.	17.	do.
140.	do. Flour 220 lbs. each, (196 nett),	do.	13.75	do.
160.	Sacks do. 280 do.	do.	20.	do.
	ON COTTON.			
8.333	Tons New Orleans and Mobile, all compressed, ...	do.	8.333	do.
9.166	do. best carrying ships, do. . .	do.	9.166	do.
4.75	do Charleston and Savannah, not compressed, ...	do.	4.75	do.
7.	do. Pernambuco and Maranham ☞ Vessels from these ports generally stow 10 per cent. more than ⅓ the register tonnage, part compressed, say 7 tons as above.	do.	7.	do.
9.7	do. Alexandria, all compressed, .	do.	9.7	do.
5.	do. do. not compressed,	do.	5.	do.
17.	Hogsheads Tobacco, . . .	do.	10.	do.
20.	do. Sugar, 16½ cwt. average, .	do.	16.5	do.
40.	Tierces Coffee, 7 cwt. do. .	do.	14.	do.
230.	Bags do. 7½ cwt. do. . .	do.	17.25	do.
17.	Tuns of Oil of 252 gals. each, .	do.	18.5	do.
17.	do. Wine, Brandy, or any other Spirit, reckoning the full guage of the Casks,	do.	20.	do.
8.	Tons Oranges and Lemons of 10 Chest or 20 Boxes per Ton, ...	do.	10.	do.
4.500	do. Cork, (Faro), ...	do.	4.5	do.
10.	do. Bark, (Tree), ...	do	10.	do.
8.	do. do. (Coppice), . . .	do.	8.	do.
110.	Tierces Beef, 3 cwt. each, . .	do.	16.5	do.
156.	Barrels Pork, 2 cwt. each, . .	do.	15.5	do.
120.	Bags Bread, 1 cwt. each, . .	do.	6.	do.
535.	Firkins Butter, 70 lbs. each, . .	do.	16.5	do.
180.	Barrels Red Herrings, . . .	do.	11.	do.
144.	do. White do.	do.	21.5	do.
20.	Hogsheads Copperas, ...	do.	17.	do.
20.	do. Lamp Black, ...	do.	7.	do.
120.	Bags do.	do.	6.	do.
16.	Tons Soda & other Alkalies, in Casks,	do.	16.	do.
21.	do. do. in Bulk, ...	do.	21.	do.
150.	Carbois, Oil Vitriol, ...	do.	8.	do.
40.	Crates Glass, 18 Tables, . . .	do.	4.5	do.
50.	do. do. 15 do.	do	5.	do.
60.	Crates Glass, 12 Tables, . . .	do.	5.5	do.
100.	Gross of Bottles = 6 per Gallon = 19 lbs. weight per dozen, in Bulk, (Glass),	do.	10.	do
200.	do. ½ Bottles = 12 per Gallon = 11 lbs. weight per Dozen, in Bulk, . .	do.	11.75	do.

Quantities in Numbers & Decimals.	Articles of Freight.	Tons Weight.	Cubic Feet.
80.	Crts. Bottles (Glass) 10¾ cubic ft each, equal	10.	850
28.	do. Earthenware, small size, . . do.	10.	do.
22.	do. do. mixed sorts or middling size, do.	9.	do.
16.	do. do. largest size, . . do.	7.	do.
7000.	Fire Bricks, . . . in Bulk, ¼	21.	638
8000.	Common do., also Tiles, do. do.	21.	do.
26.	Chaldrons Grindstones, do. ⅛	21.	425
17.	Tons Potatoes, . . . do. do.	17.	do.
20.	do. Oil Cake, . . do. do.	20.	do.
21.	do. Slates, . . . do. ⅜	21.	567
300.	Pigs of Lead, . . do. ⅛	22.	283
* 8.	Wagons of Coal, 53 cwt. each, do. do.	21.200	850

* The Content of each Wagon of Coals is 126 Cubic Feet, 8 Wagons 1008 Feet, but when stowed in bulk on board a ship, from the spreading out and pressure, become closer packed, and are proved, from practice, to stow in the space of 850 Cubic Feet.

NOTE.—As wheat is the standard equally for weight and measurement, it will be necessary to explain how it is so. The imperial corn bushel is 2218.192 cubic inches: this, multiplied by 776 (the number of bushels in 97 qrs. of wheat), and divided by 1728 (the cubic inches in one foot), gives 996 cubic feet; but, when stowed in bulk on board a ship, is reduced in measurement nearly 15 per cent., viz., to 850 cubic feet; 1st, about 8 per cent. by the ship stowing it in spaces where no measurement goods can be stowed, and the immense pressure on the lower parts of the cargo; and 2d, about 7 per cent. difference between the bushel being filled in the customary way, and what it can be made actually to hold; this, by several trials of wheat, 61 lbs. to the bushel, average nearly 5 pints, or 5-64ths, making, in all, about 15 per cent, as above. This seeming paradox, which I have taken some pains to clear up, although well known to exist, in practice, by me and every one acquainted with the stowage of goods, applies to every sort of grain, and, in fact, to every thing in bulk, according to its weight and elasticity; and 97 qrs. of wheat, is equal to 850 cubic feet.

TREENAILS.— 5333 pieces of 9 inches equal 1 load of timber; 4000 do. 12 do. do.; 3200 do. 15 do. do; 2666 do. do. 18 do. do.; 2285 do. 21 do. do.; 2000 do. 24 do. do.; 1777 do. 27 do. do.; 1600 do. 30 do. do.; 1454 do. 33 do. do.; 1333 do. 36 do. do.; 1142 do. 42 do. do.

FIR AND OAK PLANK.— 1200 pieces of ½ inch equal 1 load of timber; 600 do. 1 do. do.; 400 do. 1½ do. do.; 300 do. 2 do. do.; 240 do. 2½ do. do.; 200 do 3 do. do.; 150 do 4 do. do.; 120 do. 5 do. do.; 100 do. 6 do. do.

STOWAGE OF COTTON.

A vessel measuring 750 register tons, stowed 2550 bales Mobile Cotton, = 1,200,000 lbs. = 16·6 lbs. to the cubic foot.

A vessel measuring 798 tons stowed 2550 bales New Orleans Cotton, = 1,100,000, = 17·6 lbs. to the cubic foot, = 26 cubic feet (441 lbs.) to the bale.

A vessel measuring 729 21-95ths tons stowed 2800 bales cotton = 1,200,000 lbs.

NEW YORK RATES OF FREIGHT.

Extract from the By-Laws of the New York Chamber of Commerce.

That when Vessels are freighted by the Ton, and no special agreement is made between the Owner of the Vessel and Freighter of the Goods, respecting the proportion of tonnage which each particular article shall be computed at, the following regulation shall be the standard of computation: —

That the articles, the Bulk of which shall compose a Ton, to equal a Ton of heavy materials, shall be in weight as follows: —

Coffee in Casks	1568	lbs.	=1 ton.
Coffee in bags	1830	"	" 1 "
Cocoa in casks	1120	"	" 1 "
Cocoa in bags	1307	"	" 1 "
Pimento in casks	952	"	" 1 "
Pimento in bags	1110	"	" 1 "
Dry Hides	10	cwt.	" 1 ton.
Raw Silk, China	8	"	" 1 "
Bohea Tea, net	10	"	" 1 "
Green Teas	8	"	" 1 "
Ship Bread, bulk	8	cwt.	=1 ton.
Ship Bread, bags	7	"	" 1 "
Ship Bread, casks	6	"	" 1 "
Grain, Peas, or Beans, in casks	22	bush.	" 1 ton.
Grain, in bulk	36	"	" 1 "
Salt, European	36	"	" 1 "
Salt, West Indies	31	"	" 1 "
Sea Coal	29	"	" 1 "
Tobacco	1	hhd.	" 1 "
Pig and Bar Iron, Potashes, Sugar, Logwood, Fustic, Nicaragua Wood, and heavy Dye-woods, Rice, Honey, Copper Ore, and all other heavy Goods	20	cwt.	equal 1 ton.
Coffee, Cocoa, and Dried Cod-fish, in bulk	16	"	" 1 "
Dried Cod-fish, in casks of any size	12	"	" 1 "
Oil, Wine, Brandy, or any kind of Liquor, reckoning the full contents of the cask Wine Measure	200	gallons	equal 1 "
Mahogany, Square Timber, Oak Plank, Pine and other Boards, Beavers, Furs, Peltry, Bees' Wax, Cotton, Wool, and Bale Goods of all kinds	40	cubic ft.	equal 1 "
Flour, in barrels of 196 lbs. each	8	bbls.	" 1 "
Beef, Pork, Tallow, Pickled Fish, Pitch, Tar, and Turpntine	6	"	" 1 "

NUMBER OF CUBIC FEET IN A TON OF VARIOUS ARTICLES.

Names of Substances.	No. of pounds in a Cubic Foot.	Cubic feet to stow a ton.
Metals, &c.		
Cast Iron,	449	4.98
Wrought Iron,	487	4.59
Bar Iron,	476.93	4.69
Steel, (soft),	489.8	4.57
Steel, (hard),	488.5	4.59
Copper, (sheet),	556	4.02
Copper, (cast),	549	4.08
Brass,	537.8	4.17
Lead,	709	3.15
Tin Cast,	456	4.91
Zinc Cast,	449.37	4.98
Granite, Marble, &c.		
Sandy Bay Granite,	168.48	13.29
Quincy Granite,	167.04	13.4
Concord Granite,	159	14.09
Frankfort "	162	13.83
New York White Marble,	173	12.95
New Haven varrega. Mar.	175	12.8
Pennsylvania Dove Marble.	170	13.18
Vermont " "	168	13.33
Thomaston Blue "	179	12.51
Connecticut Sand Stone,	164	13.66
North River do.	156	14.36
Potomac do.	153	14.64
Grindstone,	133.93	16.73
Plaster Paris,	105	21.3
Glass,	180	12.44
Millstone,	155.25	14.42
Slate,	167	13.41
Paving Stone,	151	14.83
Bricks,	120	18.67
Chalk, (British),	173.81	17.92
Clay,	125	22.4
Sand,	100	22.4
Earth,	94	23 83
Ice,	58.05	38.58
COALS.		
Bituminous.		
Newcastle,	50.92	44.08
Liverpool,	47.89	46.77
Scotch,	51.09	43.84
Picton,	49.25	45.43
Sidney,	47.44	47.22
Clover Hill,	45.49	49.24
Pittsburg,	46.81	47.85
Cannelton, (Ind.),	47.65	47
Cumberland, (maximum),	53	42.26
Cumberland, (minimum),	54.29	41.26
*Anthracite.**		
Beaver Meadow,	54.92	40.78
Forest Improvement,	53.66	41.72
Lehigh,	55.31	40.50
Peach Mountain,	53.79	41.64
Lackawana,	48.87	45.84
Coke.		
Natural Virginia,	46	48.69
Cumberland,	32	70
Midlothian,	33	67.87
Charcoal.		
Hard wood, (about 29 lbs. to a bushel),	19	117.17
Pine Wood, (about 28 lbs. to a bushel),	18	124.4
Virginia Pine wood,	21	106.6
Liquids.		
Fresh Water,	62.5	35 84
Sea Water,	64.25	34.86
Whale Oil	57.5	38.95
Spirits, Proof,	57.93	38.67
Vinegar,	64.12	34.93
Olive Oil,	57.18	39.17
Linseed Oil,	58.25	38.45
Oil of Turpentine,	54.37	41.19
Tar,	63.43	35.31
Wood.		
Pitch Pine,	41.25	54.3
White Pine,	34	65.88
Yellow Pine,	32	70
Elm,	41.25	54.3
English Oak, (seasoned),	46.43	48.25
" " (unseasoned)	69.56	32.2
Live Oak,	70	32
White Oak,	45.2	49.6
Canadian Oak,	54.8	40.9
New England Fir,	34.9	64.2
Mahogany, (Spanish),	66.43	33.72
" (Bay wood),	39.81	56.26
Lignum Vitæ,	63.31	35.39
Logwood,	57.06	39.26
Cork,	15	149.
Sycamore, Chesnut & Lime Tree, each,	37.75	59.34
Box, (French),	83	27
" (Dutch),	58	38.5
Ebony, (Indian),	75.56	29.5
" (American),	83.18	27.5
Beech,	53.25	42.5
Cherry,	44.68	50.13
Walnut,	41.93	53.5

* Conventional Rate of Hard Coal, 28 bushels (5 pecks), equal a ton of 2240 pounds equal 43.5 Cubic Feet.

MEASUREMENT OF INDIA, CANTON AND MALAGA GOODS.

CALCUTTA GOODS.

Linseed, 1600 lbs., or 8¼ bags per ton.
Gunny Cloth, 29 @ 32 yds. per piece, [34 ft. per bale.
Lack Dye, 220 lbs. measure 7½ ft., 192 [lbs. 4½ ft. per case.
Gunny Bags, - small 15 ft. 2 in., or
625, small,
500, medium, } bags per ton.
425, large,
Shellac, - - - 10 ft. per case.
Cow Hides, - 20½ to 30 ft. per bale.
Goat Skins, - - 28 ft. "
~~Jutes~~ Jute - 4 bales pr ton.
Twine, - - - 890 lbs. "
Ginger, - - - 1120 lbs. "
Saltpetre, 11 to 12 bgs. pr. ton of 2240 lbs.
Buffalo Hides, - - 37 ft. per bale.

Jute

CANTON GOODS.

Tea.

Souchong, - - chests, 45-8 feet.
Congou, - - - do. 4½ "
Hyson, - - - do. 41-8 "
Hyson Skin, - - do. 43-8 "
Ningyong, - - ½ do. 23-8 "
Young Hyson, - - ½ do. 3½ "
Hyson, - - - ½ do. 3 "
Gunpowder, - ½ chests, 27-8 @ 3 feet.
Imperial, - ½ do. 27-8 @ 3 "
Hyson Skin, ½ do. 27-8 @ 3 "
Hyson, - 13 lb. boxes, 3-4 foot.
do. - 6 lb. " 4-10 "
Ningyong, - 13 lb. " 1 "
Gunpowder, 13 lb. " 3-4 "

Matting.

Rolls of 40 yards, 4-4, 8¾ rolls per ton.
do. do. 5-4, 7 " " "
Rolls of 40 yards, 6-4, 5¾ rolls per ton.

Silks.

Cases of 25 pieces Pongees, 3 1-8 feet.
do. do Sinchaws, 4 "
Fire Crackers, - - 4 3-10 feet.
Cassia, - - 5 piculs per ton.
Cases of 25 pieces Sarsnetts, 4 feet.
do. do. Damask, 4 "
Preserved Ginger, - - 13-4 "

MALAGA GOODS.

Wine, - - 8 qr. casks per ton.
do. - 14 Indian barrels "
Raisins, - - - 20 casks "
do. - - - 80 boxes "
Raisins, 160 half, or 320 qr. bxs. per ton.
Lemons, - - 20 boxes, " "
Almonds, - - 16 frails " "
Grapes, - - 40 kegs " "

MISCELLANEOUS WEIGHTS AND MEASURES.

Chaldron Coal, (Nov. Scotia) 36 bush.
" " (Cumberl'nd) 53 "
Salt, (barrel) - - - 3½ "
" (hogshead) - - - 8 "
Coffee, bag of Rio, - about 162 lbs.
" " St. Domin. " 130 "
" pocket of Java, " 50 "
Sugar, box of, from 400 to 500 lbs.
" barrel of, from 200 to 250 lbs.
Barrel of Beef, - - 200 lbs.
" Pork, - - - 200 "
" Pickled Fish, - 200 "
" Boiled Salt, - - 280 "
" Soap, - - 256 "
" Hydraulic Cement, 300 "
" Ground Plaster, 300 "
" Lime, - - 225 "
" Butter, - - - 224 "
" Flour, (net,) - 196 "
" Wheat, contains 5 bsh.
" Indian Corn (57 lbs. to the bushel,) 3⅛ bsh
" Cider, (in Mass.) 32 galls.

Cotton.

Bale of (Virginia, Carolina, Georgia, W. Indies) 300 to 310 lbs.
" (New Orleans and Alabama,) - - 400 to 500 lbs.
" (East Indies,) 320 to 380 lbs.
" (Brazilian,) 160 to 200 lbs.
" (Egyptian,) 180 to 300 lbs.
Flax, bale of (Russia) from 5 to 6 cwt.
Chest of Tea, Congou, about 84 lbs.
" " Hyson, 60 to 80 "
Teas, ½ chest, about 40 lbs. net.
Honey, (gallon) - - - 12 lbs.
Cask of Rice, (American) - 6 cwt.
Chaldron of Coal, (London,) 25½ "
" " (Newcastle of 3 wanes,) - - 52½ "
The use of heaped measures is abolished in England.
Quarter of Wheat, (English) 8 bush.
An English Quarter equals 8¼ U. S. "
Drum of Figs, - - - 24 lbs.

MERCHANT'S AND SEAMAN'S

EXPEDITIOUS CALCULATOR.

SHIPPER'S, MATE'S, AND EXPRESSMAN'S EXPEDITIOUS MEASURER.

If a Package exceed 6 Feet in Length, add together the *feet* and *inches* opposite any two lengths, or take *twice* one length.

If the Depth or Breadth of a Package cannot be found in the Tables, add the products of two Breadths together, or take *twice* one Breadth.

If the Length of a Box or Package is in Feet and Inches, add the *Inches*, (below), to the Feet. Supposing a Box, 3 feet 3 inches long, *add* the 3 *inches*, but if 3 feet 9 inches long, then *deduct* 3 inches from 4 feet.

Also, see *Rules* and *Examples* at the close of these Tables.

Length		5 *Inches Wide, Deep, or Thick, — By*																			
ft.	*in.*	5 *in.*		6 *in.*		7 *in.*		8 *in.*		9 *in.*		10 *in.*		11 *in.*		12 *in.*		13 *in.*		14 *in.*	
1	—	0	2	0	3	0	3	0	3	0	4	0	4	0	5	0	5	0	5	0	6
2	—	0	4	0	5	0	6	0	7	0	8	0	8	0	9	0	10	0	11	1	0
3	—	0	6	0	8	0	9	0	10	0	11	1	1	1	2	1	3	1	4	1	6
4	—	0	8	0	10	1	0	1	1	1	3	1	5	1	6	1	8	1	10	1	11
5	—	0	10	1	1	1	3	1	5	1	7	1	9	1	11	2	1	2	3	2	5
6	—	1	1	1	3	1	6	1	8	1	11	2	1	2	4	2	6	2	9	2	11
—	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
—	2	0	0	0	0	0	0	0	1	0	1	0	1	0	1	0	1	0	1	0	1
—	3	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
—	6	0	1	0	1	0	1	0	2	0	2	0	2	0	2	0	3	0	3	0	3

Length		6 *Inches Wide, Deep, or Thick, — By*																			
ft.	*in.*	6 *in.*		7 *in.*		8 *in.*		9 *in.*		10 *in.*		11 *in.*		12 *in.*		13 *in.*		14 *in.*		15 *in.*	
1	—	0	3	0	4	0	4	0	5	0	5	0	6	0	6	0	7	0	7	0	8
2	—	0	6	0	7	0	8	0	9	0	10	0	11	1	0	1	1	1	2	1	3
3	—	0	9	0	11	1	0	1	2	1	3	1	5	1	6	1	8	1	9	1	11
4	—	1	0	1	2	1	4	1	6	1	8	1	10	2	0	2	2	2	4	2	6
5	—	1	3	1	6	1	8	1	11	2	1	2	4	2	6	2	9	2	11	3	2
6	—	1	6	1	9	2	0	2	3	2	6	2	9	3	0	3	3	3	6	3	9
—	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	1
—	2	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
—	3	0	1	0	1	0	1	0	1	0	1	0	1	0	2	0	2	0	2	0	2
—	6	0	2	0	2	0	2	0	2	0	3	0	3	0	3	0	3	0	4	0	4

Length		7 *Inches Wide, Deep, or Thick, — By*																			
ft.	*in.*	7 *in.*		8 *in.*		9 *in.*		10 *in.*		11 *in.*		12 *in.*		13 *in.*		14 *in.*		15 *in.*		16 *in.*	
1	—	0	4	0	5	0	5	0	6	0	6	0	7	0	8	0	8	0	9	0	9
2	—	0	8	0	9	0	11	1	0	1	1	1	2	1	3	1	4	1	6	1	7
3	—	1	0	1	2	1	4	1	6	1	7	1	9	1	11	2	1	2	2	2	4
4	—	1	4	1	7	1	9	1	11	2	2	2	4	2	6	2	9	2	11	3	1
5	—	1	8	1	11	2	2	2	5	2	8	2	11	3	2	3	5	3	8	3	11
6	—	2	1	2	4	2	8	2	11	3	3	3	6	3	10	4	1	4	5	4	8
—	1	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	1	0	1	0	1
—	2	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	2
—	3	0	1	0	1	0	1	0	1	0	2	0	2	0	2	0	2	0	2	0	2
—	6	0	2	0	2	0	3	0	3	0	3	0	4	0	4	0	4	0	4	0	5

Length		8 *Inches Wide, Deep or Thick, — By*															
ft.	*in.*	8 *in.*		9 *in.*		10 *in.*		11 *in.*		12 *in.*		13 *in.*		14 *in.*		15 *in.*	
1	—	0	5	0	6	0	7	0	7	0	8	0	9	0	9	0	10
2	—	0	11	1	0	1	1	1	3	1	4	1	5	1	7	1	8
3	—	1	4	1	6	1	8	1	10	2	0	2	2	2	4	2	6
4	—	1	9	2	0	2	3	2	5	2	8	2	11	3	1	3	4
5	—	2	3	2	6	2	9	3	1	3	4	3	7	3	11	4	2
6	—	2	8	3	0	3	4	3	8	4	0	4	4	4	8	5	0
—	1	0	0	0	1	0	1	0	1	0	1	0	1	0	1	0	1
—	2	0	1	0	1	0	1	0	1	0	1	0	1	0	2	0	2
—	3	0	1	0	2	0	2	0	2	0	2	0	2	0	2	0	3
—	6	0	3	0	3	0	3	0	4	0	4	0	4	0	5	0	5

Length		9 *Inches Wide, Deep, or Thick, — By*															
ft.	*in.*	9 *in.*		10 *in.*		11 *in.*		12 *in*		13 *in.*		14 *in*		15 *in.*		16 *in.*	
1	—	0	7	0	8	0	8	0	9	0	10	0	11	0	11	1	0
2	—	1	2	1	3	1	5	1	6	1	8	1	9	1	11	2	0
3	—	1	8	1	11	2	1	2	3	2	5	2	8	2	10	3	0
4	—	2	3	2	6	2	9	3	0	3	3	3	6	3	9	4	0
5	—	2	10	3	2	3	5	3	9	4	1	4	5	4	8	5	0
6	—	3	5	3	9	4	2	4	6	4	11	5	3	5	8	6	0
—	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
—	2	0	1	0	1	0	1	0	2	0	2	0	2	0	2	0	2
—	3	0	2	0	2	0	2	0	2	0	2	0	3	0	3	0	3
—	6	0	3	0	4	0	4	0	5	0	5	0	5	0	6	0	6

Length		10 *Inches Wide, Deep, or Thick, — By*															
ft.	*in*	10 *in.*		11 *in.*		12 *in.*		13 *in.*		14 *in.*		15 *in.*		16 *in.*		17 *in.*	
1	—	0	8	0	9	0	10	0	11	1	0	1	1	1	1	1	2
2	—	1	5	1	6	1	8	1	10	1	11	2	1	2	3	2	4
3	—	2	1	2	4	2	6	2	9	2	11	3	2	3	4	3	7
4	—	2	9	3	1	3	4	3	7	3	11	4	2	4	5	4	9
5	—	3	6	3	10	4	2	4	6	4	10	5	3	5	7	5	11
6	—	4	2	4	7	5	0	5	5	5	10	6	3	6	8	7	1
—	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
—	2	0	1	0	2	0	2	0	2	0	2	0	2	0	2	0	3
—	3	0	2	0	2	0	3	0	3	0	3	0	3	0	3	0	4
—	6	0	4	0	5	0	5	0	5	0	6	0	6	0	7	0	7

Length		11 *Inches Wide, Deep, or Thick, — By*															
ft.	*in.*	11 *in.*		12 *in.*		13 *in.*		14 *in.*		15 *in.*		16 *in.*		17 *in.*		18 *in.*	
1	—	0	10	0	11	1	0	1	1	1	2	1	3	1	4	1	5
2	—	1	8	1	10	2	0	2	2	2	4	2	5	2	7	2	9
3	—	2	6	2	9	3	0	3	3	3	5	3	8	3	11	4	2
4	—	3	4	3	8	4	0	4	3	4	7	4	11	5	2	5	6
5	—	4	2	4	7	5	0	5	4	5	9	6	1	6	6	6	11
6	—	5	1	5	6	6	0	6	5	6	11	7	4	7	10	8	3
—	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
—	2	0	2	0	2	0	2	0	2	0	2	0	2	0	3	0	3
—	3	0	3	0	3	0	3	0	3	0	3	0	4	0	4	0	4
—	6	0	5	0	6	0	6	0	6	0	7	0	7	0	8	0	8

Length		12 *Inches Wide, Deep, or Thick, — By*																	
ft.	*in.*	12 *in.*		13 *in.*		14 *in.*		15 *in.*		16 *in.*		17 *in.*		18 *in.*		19 *in.*		20 *in.*		21 *in.*	
1	—	1	0	1	1	1	2	1	3	1	4	1	5	1	6	1	7	1	8	1	9
2	—	2	0	2	2	2	4	2	6	2	8	2	10	3	0	3	2	3	4	3	6
3	—	3	0	3	3	3	6	3	9	4	0	4	3	4	6	4	9	5	0	5	3
4	—	4	0	4	4	4	8	5	0	5	4	5	8	6	0	6	4	6	8	7	0
5	—	5	0	5	5	5	10	6	3	6	8	7	1	7	6	7	11	8	4	8	9
6	—	6	0	6	6	7	0	7	6	8	0	8	6	9	0	9	6	10	0	10	6
—	1	0	1	0	1	0	1	0	1	0	1	0	1	0	2	0	2	0	2	0	2
—	2	0	2	0	2	0	2	0	3	0	3	0	3	0	3	0	3	0	3	0	4
—	3	0	3	0	3	0	4	0	4	0	4	0	4	0	5	0	5	0	5	0	5
—	6	0	6	0	7	0	7	0	8	0	8	0	9	0	9	0	10	0	10	0	11

Length		13 *Inches Wide, Deep or Thick, — By*																	
ft.	*in.*	13 *in.*		14 *in.*		15 *in.*		16 *in.*		17 *in.*		18 *in.*		19 *in.*		20 *in.*		21 *in.*		22 *in.*	
1	—	1	2	1	3	1	4	1	5	1	6	1	8	1	9	1	10	1	11	2	0
2	—	2	4	2	6	2	9	2	11	3	1	3	3	3	5	3	7	3	10	4	0
3	—	3	6	3	10	4	1	4	4	4	7	4	11	5	2	5	5	5	8	6	0
4	—	4	8	5	1	5	5	5	9	6	2	6	6	6	10	7	3	7	7	7	11
5	—	5	10	6	4	6	9	7	3	7	8	8	2	8	7	9	0	9	6	9	11
6	—	7	1	7	7	8	2	8	8	9	3	9	9	10	4	10	10	11	5	11	11
—	1	0	1	0	1	0	1	0	1	0	2	0	2	0	2	0	2	0	2	0	2
—	2	0	2	0	3	0	3	0	3	0	3	0	3	0	3	0	4	0	4	0	4
—	3	0	4	0	4	0	4	0	4	0	5	0	5	0	5	0	5	0	6	0	6
—	6	0	7	0	8	0	8	0	9	0	9	0	10	0	10	0	11	0	11	1	0

Length		14 *Inches Wide, Deep, or Thick, — By*																	
ft.	*in.*	14 *in.*		15 *in.*		16 *in.*		17 *in.*		18 *in.*		19 *in*		20 *in.*		21 *in,*		22 *in.*		23 *in.*	
1	—	1	4	1	6	1	7	1	8	1	9	1	10	1	11	2	1	2	2	2	3
2	—	2	9	2	11	3	1	3	4	3	6	3	8	3	11	4	1	4	3	4	6
3	—	4	1	4	5	4	8	5	0	5	3	5	7	5	10	6	2	6	5	6	9
4	—	5	5	5	10	6	3	6	7	7	0	7	5	7	9	8	2	8	7	8	11
5	—	6	10	7	4	7	9	8	3	8	9	9	3	9	9	10	3	10	8	11	2
6	—	8	2	8	9	9	4	9	11	10	6	11	1	11	8	12	3	12	10	13	5
—	1	0	1	0	1	0	2	0	2	0	2	0	2	0	2	0	2	0	2	0	2
—	2	0	3	0	3	0	3	0	3	0	4	0	4	0	4	0	4	0	4	0	4
—	3	0	4	0	4	0	5	0	5	0	5	0	6	0	6	0	6	0	6	0	7
—	6	0	8	0	9	0	9	0	10	0	11	0	11	1	0	1	0	1	1	1	1

Length		15 *Inches Wide, Deep, or Thick, — By*																	
ft.	*in.*	15 *in*		16 *in.*		17 *in.*		18 *in.*		19 *in.*		20 *in*		21 *in.*		22 *in.*		23 *in.*		24 *in.*	
1	—	1	7	1	8	1	9	1	11	2	0	2	1	2	2	2	4	2	5	2	6
2	—	3	2	3	4	3	7	3	9	4	0	4	2	4	5	4	7	4	10	5	0
3	—	4	8	5	0	5	4	5	8	5	11	6	3	6	7	6	11	7	2	7	6
4	—	6	3	6	8	7	1	7	6	7	11	8	4	8	9	9	2	9	7	10	0
5	—	7	10	8	4	8	10	9	5	9	11	10	5	10	11	11	6	12	0	12	6
6	—	9	5	10	0	10	8	11	3	11	11	12	6	13	2	13	9	14	5	15	0
—	1	0	2	0	2	0	2	0	2	0	2	0	2	0	2	0	2	0	2	0	3
—	2	0	3	0	3	0	4	0	4	0	4	0	4	0	4	0	5	0	5	0	5
—	3	0	5	0	5	0	5	0	6	0	6	0	6	0	7	0	7	0	7	0	8
—	6	0	9	0	10	0	11	0	11	1	0	1	1	1	1	1	2	1	2	1	3

Length		16 *Inches Wide, Deep, or Thick,* — *By*															
ft.	*in.*	16 *in.*		17 *in.*		18 *in.*		19 *in.*		20 *in.*		21 *in.*		22 *in.*		23 *in.*		24 *in.*		25 *in.*	
1	—	1	9	1	11	2	0	2	1	2	3	2	4	2	5	2	7	2	8	2	9
2	—	3	7	3	9	4	0	4	3	4	5	4	8	4	11	5	1	5	4	5	7
3	—	5	4	5	8	6	0	6	4	6	8	7	0	7	4	7	8	8	0	8	4
4	—	7	1	7	7	8	0	8	5	8	11	9	4	9	9	10	3	10	8	11	1
5	—	8	11	9	5	10	0	10	7	11	1	11	8	12	3	12	9	13	4	13	11
6	—	10	8	11	4	12	0	12	8	13	4	14	0	14	8	15	4	16	0	16	8
—	1	0	2	0	2	0	2	0	2	0	2	0	2	0	2	0	3	0	3	0	3
—	2	0	4	0	4	0	4	0	4	0	4	0	5	0	5	0	5	0	5	0	6
—	3	0	5	0	6	0	6	0	6	0	7	0	7	0	7	0	8	0	8	0	8
—	6	0	11	0	11	1	0	1	1	1	1	1	2	1	3	1	3	1	4	1	5

Length		17 *Inches Wide, Deep, or Thick,* — *By*																	
ft.	*in.*	17 *in.*		18 *in.*		19 *in.*		20 *in.*		21 *in.*		22 *in.*		23 *in.*		24 *in.*		25 *in.*		26 *in.*	
1	—	2	0	2	2	2	3	2	4	2	6	2	7	2	9	2	10	2	11	3	1
2	—	4	0	4	3	4	6	4	9	5	0	5	2	5	5	5	8	5	11	6	2
3	—	6	0	6	5	6	9	7	1	7	5	7	10	8	2	8	6	8	10	9	3
4	—	8	0	8	6	9	0	9	5	9	11	10	5	10	10	11	4	11	10	12	3
5	—	10	0	10	8	11	3	11	10	12	5	13	0	13	7	14	2	14	9	15	4
6	—	12	1	12	9	13	6	14	2	14	11	15	7	16	4	17	0	17	9	18	5
—	1	0	2	0	2	0	2	0	2	0	2	0	3	0	3	0	3	0	3	0	3
—	2	0	4	0	4	0	4	0	5	0	5	0	5	0	5	0	6	0	6	0	6
—	3	0	6	0	6	0	7	0	7	0	7	0	8	0	8	0	9	0	9	0	9
—	6	1	0	1	1	1	1	1	2	1	3	1	4	1	4	1	5	1	6	1	6

Length		18 *Inches Wide, Deep, or Thick,* — *By*																	
ft.	*in.*	18 *in*		19 *in.*		20 *in.*		21 *in.*		22 *in.*		23 *in.*		24 *in*		25 *in.*		26 *in.*		27 *in.*	
1	—	2	3	2	5	2	6	2	8	2	9	2	11	3	0	3	2	3	3	3	5
2	—	4	6	4	9	5	0	5	3	5	6	5	9	6	0	6	3	6	6	6	9
3	—	6	9	7	2	7	6	7	11	8	3	8	8	9	0	9	5	9	9	10	2
4	—	9	0	9	6	10	0	10	6	11	0	11	6	12	0	12	6	13	0	13	6
5	—	11	3	11	11	12	6	13	2	13	9	14	5	15	0	15	8	16	3	16	11
6	—	13	6	14	3	15	0	15	9	16	6	17	3	18	0	18	9	19	6	20	3
—	1	0	2	0	2	0	3	0	3	0	3	0	3	0	3	0	3	0	3	0	3
—	2	0	5	0	5	0	5	0	5	0	6	0	6	0	6	0	6	0	7	0	7
—	3	0	7	0	7	0	8	0	8	0	8	0	9	0	9	0	9	0	10	0	10
—	6	1	2	1	2	1	3	1	4	1	5	1	5	1	6	1	7	1	8	1	8

Length		19 *Inches Wide, Deep, or Thick,* — *By*																	
ft.	*in.*	19 *in.*		20 *in.*		21 *in.*		22 *in.*		23 *in.*		24 *in.*		25 *in.*		26 *in.*		27 *in*		28 *in.*	
1	—	2	6	2	8	2	9	2	11	3	0	3	2	3	4	3	5	3	7	3	8
2	—	5	0	5	3	5	7	5	10	6	1	6	4	6	7	6	10	7	2	7	5
3	—	7	6	7	11	8	4	8	9	9	1	9	6	9	11	10	4	10	8	11	1
4	—	10	0	10	7	11	1	11	7	12	2	12	8	13	2	13	9	14	3	14	9
5	—	12	6	13	2	13	10	14	6	15	2	15	10	16	6	17	2	17	10	18	6
6	—	15	1	15	10	16	8	17	5	18	3	19	0	19	10	20	7	21	5	22	2
—	1	0	3	0	3	0	3	0	3	0	3	0	3	0	3	0	3	0	4	0	4
—	2	0	5	0	5	0	6	0	6	0	6	0	6	0	7	0	7	0	7	0	7
—	3	0	8	0	8	0	8	0	9	0	9	0	10	0	10	0	10	0	11	0	11
—	6	1	3	1	4	1	5	1	5	1	6	1	7	1	8	1	9	1	9	1	10

Length		20 *Inches Wide, Deep, or Thick, — By*																	
ft	*in.*	20 *in.*		21 *in.*		22 *in.*		23 *in.*		24 *in.*		25 *in.*		26 *in.*		27 *in*		28 *in.*		29 *in.*	
1	—	2	9	2	11	3	1	3	2	3	4	3	6	3	7	3	9	3	11	4	0
2	—	5	7	5	10	6	1	6	5	6	8	6	11	7	3	7	6	7	9	8	1
3	—	8	4	8	9	9	2	9	7	10	0	10	5	10	10	11	3	11	8	12	1
4	—	11	1	11	8	12	3	12	9	13	4	13	11	14	5	15	0	15	7	16	1
5	—	13	11	14	7	15	3	16	0	16	8	17	4	18	1	18	9	19	5	20	2
6	—	16	8	17	6	18	4	19	2	20	0	20	10	21	8	22	6	23	4	24	2
—	1	0	3	0	3	0	3	0	3	0	3	0	3	0	4	0	4	0	4	0	4
—	2	0	6	0	6	0	6	0	6	0	7	0	7	0	7	0	8	0	8	0	8
—	3	0	8	0	9	0	9	0	10	0	10	0	10	0	11	0	11	1	0	1	0
—	6	1	5	1	6	1	6	1	7	1	8	1	9	1	10	1	11	1	11	2	0

Length		21 *Inches Wide, Deep, or Thick, — By*																	
ft.	*in.*	21 *in.*		22 *in.*		23 *in.*		24 *in.*		25 *in.*		26 *in.*		27 *in.*		28 *in.*		29 *in.*		30 *in.*	
1	—	3	1	3	3	3	4	3	6	3	8	3	10	3	11	4	1	4	3	4	5
2	—	6	2	6	5	6	9	7	0	7	4	7	7	7	11	8	2	8	6	8	9
3	—	9	2	9	8	10	1	10	6	10	11	11	5	11	10	12	3	12	8	13	2
4	—	12	3	12	10	13	5	14	0	14	7	15	2	15	9	16	4	16	11	17	6
5	—	15	4	16	1	16	9	17	6	18	3	19	0	19	8	20	5	21	2	21	11
6	—	18	5	19	3	20	2	21	0	21	11	22	9	23	8	24	6	25	5	26	3
—	1	0	3	0	3	0	3	0	4	0	4	0	4	0	4	0	4	0	4	0	4
—	2	0	6	0	6	0	7	0	7	0	7	0	8	0	8	0	8	0	8	0	9
—	3	0	9	0	10	0	10	0	11	0	11	0	11	1	0	1	0	1	1	1	1
—	6	1	6	1	7	1	8	1	9	1	10	1	11	2	0	2	1	2	1	2	2

Length		22 *Inches Wide, Deep, or Thick, — By*																	
ft.	*in.*	22 *in*		23 *in.*		24 *in.*		25 *in.*		26 *in*		27 *in.*		28 *in*		29 *in.*		30 *in.*		31 *in.*	
1	—	3	4	3	6	3	8	3	10	4	0	4	2	4	3	4	5	4	7	4	9
2	—	6	9	7	0	7	4	7	8	7	11	8	3	8	7	8	10	9	2	9	6
3	—	10	1	10	7	11	0	11	6	11	11	12	5	12	10	13	4	13	9	14	3
4	—	13	5	14	1	14	8	15	3	15	11	16	6	17	1	17	9	18	4	18	11
5	—	16	10	17	7	18	4	19	1	19	10	20	8	21	5	22	2	22	11	23	8
6	—	20	2	21	1	22	0	22	11	23	10	24	9	25	8	26	7	27	6	28	5
—	1	0	3	0	4	0	4	0	4	0	4	0	4	0	4	0	4	0	5	0	5
—	2	0	7	0	7	0	7	0	8	0	8	0	8	0	9	0	9	0	9	0	9
—	3	0	10	0	11	0	11	0	11	1	0	1	0	1	1	1	1	1	2	1	2
—	6	1	8	1	9	1	10	1	11	2	0	2	1	2	2	2	3	2	4	2	4

Length		23 *Inches Wide, Deep, or Thick, — By*																	
ft.	*in.*	23 *in.*		24 *in.*		25 *in.*		26 *in.*		27 *in.*		28 *in.*		29 *in.*		30 *in.*		31 *in*		32 *in.*	
1	—	3	8	3	10	4	0	4	2	4	4	4	6	4	8	4	10	4	11	5	1
2	—	7	4	7	8	8	0	8	4	8	8	8	11	9	3	9	7	9	11	10	3
3	—	11	0	11	6	12	0	12	6	12	11	13	5	13	11	14	5	14	10	15	4
4	—	14	8	15	4	16	0	16	7	17	3	17	11	18	6	19	2	19	10	20	5
5	—	18	4	19	2	20	0	20	9	21	7	22	4	23	2	24	0	24	9	25	7
6	—	22	1	23	0	24	0	24	11	25	11	26	10	27	10	28	9	29	9	30	8
—	1	0	4	0	4	0	4	0	4	0	4	0	4	0	5	0	5	0	5	0	5
—	2	0	7	0	8	0	8	0	8	0	9	0	9	0	9	0	10	0	10	0	10
—	3	0	11	1	0	1	0	1	0	1	1	1	1	1	2	1	2	1	3	1	3
—	6	1	10	1	11	2	0	2	1	2	2	2	3	2	4	2	5	2	6	2	7

Length		24 *Inches Wide, Deep, or Thick, — By*																	
ft.	*in.*	24 *in.*		25 *in.*		26 *in.*		27 *in.*		28 *in.*		29 *in.*		30 *in.*		31 *in.*		32 *in.*		33 *in.*	
1	—	4	0	4	2	4	4	4	6	4	8	4	10	5	0	5	2	5	4	5	6
2	—	8	0	8	4	8	8	9	0	9	4	9	8	10	0	10	4	10	8	11	0
3	—	12	0	12	6	13	0	13	6	14	0	14	6	15	0	15	6	16	0	16	6
4	—	16	0	16	8	17	4	18	0	18	8	19	4	20	0	20	8	21	4	22	0
5	—	20	0	20	10	21	8	22	6	23	4	24	2	25	0	25	10	26	8	27	6
6	—	24	0	25	0	26	0	27	0	28	0	29	0	30	0	31	0	32	0	33	0
—	1	0	4	0	4	0	4	0	5	0	5	0	5	0	5	0	5	0	5	0	6
—	2	0	8	0	8	0	9	0	9	0	9	0	10	0	10	0	10	0	11	0	11
—	3	1	0	1	1	1	1	1	2	1	2	1	3	1	3	1	4	1	4	1	5
—	6	2	0	2	1	2	2	2	3	2	4	2	5	2	6	2	7	2	8	2	9

Length		25 *Inches Wide, Deep or Thick, — By*																	
ft.	*in.*	25 *in.*		26 *in.*		27 *in*		28 *in*		29 *in.*		30 *in.*		31 *in.*		32 *in.*		33 *in.*		34 *in.*	
1	—	4	4	4	6	4	8	4	10	5	0	5	3	5	5	5	7	5	9	5	11
2	—	8	8	9	0	9	5	9	9	10	1	10	5	10	9	11	1	11	6	11	10
3	—	13	0	13	7	14	1	14	7	15	1	15	8	16	2	16	8	17	2	17	9
4	—	17	4	18	1	18	9	19	5	20	2	20	10	21	6	22	3	22	11	23	7
5	—	21	8	22	7	23	5	24	4	25	2	26	1	26	11	27	9	28	8	29	6
6	—	26	1	27	1	28	2	29	2	30	3	31	3	32	4	33	4	34	5	35	5
—	1	0	4	0	5	0	5	0	5	0	5	0	5	0	5	0	6	0	6	0	6
—	2	0	9	0	9	0	9	0	10	0	10	0	10	0	11	0	7	0	11	1	0
—	3	1	1	1	2	1	2	1	3	1	3	1	4	1	4	1	5	1	5	1	6
—	6	2	2	2	3	2	4	2	5	2	6	2	7	2	8	2	9	2	10	2	11

Length		26 *Inches Wide, Deep, or Thick, — By*																	
ft.	*in.*	26 *in.*		27 *in.*		28 *in.*		29 *in.*		30 *in.*		31 *in*		32 *in*		33 *in.*		34 *in.*		35 *in.*	
1	—	4	8	4	11	5	1	5	3	5	5	5	7	5	9	6	0	6	2	6	4
2	—	9	5	9	9	10	1	10	6	10	10	11	2	11	7	11	11	12	3	12	8
3	—	14	1	14	8	15	2	15	9	16	3	16	10	17	4	17	11	18	5	19	0
4	—	18	9	19	6	20	3	20	11	21	8	22	5	23	1	23	10	24	7	25	3
5	—	23	6	24	5	25	3	26	2	27	1	28	0	28	11	29	10	30	8	31	7
6	—	28	2	29	3	30	4	31	5	32	6	33	7	34	8	35	9	36	10	37	11
—	1	0	5	0	5	0	5	0	5	0	5	0	6	0	6	0	6	0	6	0	6
—	2	0	9	0	10	0	10	0	10	0	11	0	11	1	0	1	0	1	0	1	1
—	3	1	2	1	3	1	3	1	4	1	4	1	5	1	5	1	6	1	6	1	7
—	6	2	4	2	5	2	6	2	7	2	9	2	10	2	11	3	0	3	1	3	2

Length		27 *Inches Wide, Deep, or Thick, — By*																	
ft.	*in.*	27 *in*		28 *in*		29 *in.*		30 *in.*		31 *in.*		32 *in*		33 *in*		34 *in.*		35 *in.*		36 *in.*	
1	—	5	1	5	3	5	5	5	8	5	10	6	0	6	2	6	5	6	7	6	9
2	—	10	2	10	6	10	11	11	3	11	8	12	0	12	5	12	9	13	2	13	6
3	—	15	2	15	9	16	4	16	11	17	5	18	0	18	7	19	2	19	8	20	3
4	—	20	3	21	0	21	9	22	6	23	3	24	0	24	9	25	6	26	3	27	0
5	—	25	4	26	3	27	2	28	2	29	1	30	0	30	11	31	11	32	10	33	9
6	—	30	5	31	6	32	8	33	9	34	11	36	0	37	2	38	3	39	5	40	6
—	1	0	5	0	5	0	5	0	6	0	6	0	6	0	6	0	6	0	7	0	7
—	2	0	10	0	11	0	11	0	11	1	0	1	0	1	0	1	1	1	1	1	2
—	3	1	3	1	4	1	4	1	5	1	5	1	6	1	7	1	7	1	8	1	8
—	6	2	6	2	8	2	9	2	10	2	11	3	0	3	1	3	2	3	3	3	5

Length		28 *Inches Wide, Deep, or Thick, — By*															
ft.	*in.*	28 *in.*		29 *in.*		30 *in.*		31 *in.*		32 *in.*		33 *in.*		34 *in.*		35 *in.*		36 *in.*		37 *in.*	
1	—	5	5	5	8	5	10	6	0	6	3	6	5	6	7	6	10	7	0	7	2
2	—	10	11	11	3	11	8	12	1	12	5	12	10	13	3	13	7	14	0	14	5
3	—	16	4	16	11	17	6	18	1	18	8	19	3	19	10	20	5	21	0	21	7
4	—	21	9	22	7	23	4	24	1	24	11	25	8	26	5	27	3	28	0	28	9
5	—	27	3	28	2	29	2	30	2	31	1	32	1	33	1	34	0	35	0	36	0
6	—	32	8	33	10	35	0	36	2	37	4	38	6	39	8	40	10	42	0	43	2
—	1	0	5	0	6	0	6	0	6	0	6	0	6	0	7	0	7	0	7	0	7
—	2	0	11	0	11	1	0	1	0	1	0	1	1	1	1	1	2	1	2	1	2
—	3	1	4	1	5	1	6	1	6	1	7	1	7	1	8	1	8	1	9	1	10
—	6	2	9	2	10	2	11	3	0	3	1	3	3	3	4	3	5	3	6	3	7

Length		29 *Inches Wide, Deep, or Thick, — By*															
ft.	*in.*	29 *in.*		30 *in.*		31 *in.*		32 *in.*		33 *in.*		34 *in.*		35 *in.*		36 *in*		37 *in.*		38 *in.*	
1	—	5	10	6	1	6	3	6	5	6	8	6	10	7	1	7	3	7	5	7	8
2	—	11	8	12	1	12	6	12	11	13	4	13	8	14	1	14	6	14	11	15	4
3	—	17	6	18	2	18	9	19	4	19	11	20	7	21	2	21	9	22	4	23	0
4	—	23	4	24	2	25	0	25	9	26	7	27	5	28	2	29	0	29	10	30	7
5	—	29	2	30	3	31	3	32	3	33	3	34	3	35	3	36	3	37	3	38	3
6	—	35	1	36	3	37	6	38	8	39	11	41	1	42	4	43	6	44	9	45	11
—	1	0	6	0	6	0	6	0	6	0	7	0	7	0	7	0	7	0	7	0	8
—	2	1	0	1	0	1	0	1	1	1	1	1	2	1	2	1	3	1	3	1	3
—	3	1	6	1	6	1	7	1	7	1	8	1	9	1	9	1	10	1	10	1	11
—	6	2	11	3	0	3	1	3	3	3	4	3	5	3	6	3	8	3	9	3	10

Length		30 *Inches Wide, Deep, or Thick, — By*															
ft.	*in.*	30 *in.*		31 *in.*		32 *in.*		33 *in.*		34 *in.*		35 *in.*		36 *in.*		37 *in.*		38 *in.*		39 *in.*	
1	—	6	3	6	6	6	8	6	11	7	1	7	4	7	6	7	9	7	11	8	2
2	—	12	6	12	11	13	4	13	9	14	2	14	7	15	0	15	5	15	10	16	3
3	—	18	9	19	5	20	0	20	8	21	3	21	11	22	6	23	2	23	9	24	5
4	—	25	0	25	10	26	8	27	6	28	4	29	2	30	0	30	10	31	8	32	6
5	—	31	3	32	4	33	4	34	5	35	5	36	6	37	6	38	7	39	7	40	8
6	—	37	6	38	9	40	0	41	3	42	6	43	9	45	0	46	3	47	6	48	9
—	1	0	6	0	6	0	7	0	7	0	7	0	7	0	8	0	8	0	8	0	8
—	2	1	1	1	1	1	1	1	2	1	2	1	3	1	3	1	3	1	4	1	4
—	3	1	7	1	7	1	8	1	9	1	9	1	10	1	11	1	11	2	0	2	0
—	6	3	2	3	3	3	4	3	5	3	7	3	8	3	9	3	10	4	0	4	1

Length		31 *Inches Wide, Deep, or Thick, — By*															
ft.	*in.*	31 *in.*		32 *in.*		33 *in*		34 *in.*		35 *in.*		36 *in.*		37 *in.*		38 *in.*		39 *in.*		40 *in.*	
1	—	6	8	6	11	7	1	7	4	7	6	7	9	8	0	8	2	8	5	8	7
2	—	13	4	13	9	14	3	14	8	15	1	15	6	15	11	16	4	16	10	17	3
3	—	20	0	20	8	21	4	22	0	22	7	23	3	23	11	24	7	25	2	25	10
4	—	26	8	27	7	28	5	29	3	30	2	31	0	31	10	32	9	33	7	34	5
5	—	33	4	34	5	35	6	36	7	37	8	38	9	39	10	40	11	42	0	43	1
6	—	40	1	41	4	42	8	43	11	45	3	46	6	47	10	49	1	50	5	51	8
—	1	0	7	0	7	0	7	0	7	0	8	0	8	0	8	0	8	0	8	0	9
—	2	1	1	1	2	1	2	1	3	1	3	1	4	1	4	1	4	1	5	1	5
—	3	1	8	1	9	1	9	1	10	1	11	1	11	2	0	2	1	2	1	2	2
—	6	3	4	3	5	3	7	3	8	3	9	3	11	4	0	4	1	4	2	4	4

Length		32 *Inches Wide, Deep, or Thick, — By*																	
ft.	*in.*	32 *in.*		33 *in*		34 *in.*		35 *in.*		36 *in.*		37 *in*		38 *in.*		39 *in.*		40 *in.*	41 *in.*
1	—	7	1	7	4	7	7	7	9	8	0	8	3	8	5	8	8	8 11	9 1
2	—	14	3	14	8	15	1	15	7	16	0	16	5	16	11	17	4	17 9	18 3
3	—	21	4	22	0	22	8	23	4	24	0	24	8	25	4	26	0	26 8	27 4
4	—	28	5	29	4	30	3	31	1	32	0	32	11	33	9	34	8	35 7	36 5
5	—	35	7	36	8	37	9	38	11	40	0	41	1	42	3	43	4	44 5	45 7
6	—	42	8	44	0	45	4	46	8	48	0	49	4	50	8	52	0	53 4	54 8
—	1	0	7	0	7	0	8	0	8	0	8	0	8	0	8	0	9	0 9	0 9
—	2	1	2	1	3	1	3	1	4	1	4	1	4	1	5	1	5	1 6	1 6
—	3	1	9	1	10	1	11	1	11	2	0	2	1	2	1	2	2	2 3	2 3
—	6	3	7	3	8	3	9	3	11	4	0	4	1	4	3	4	4	4 5	4 7

Length		33 *Inches Wide, Deep, or Thick, —By*																	
ft.	*in.*	33 *in.*		34 *in.*		35 *in.*		36 *in.*		37 *in.*		38 *in.*		39 *in.*		40 *in.*		41 *in.*	42 *in.*
1	—	7	7	7	10	8	0	8	3	8	6	8	9	8	11	9	2	9 5	9 8
2	—	15	2	15	7	16	1	16	6	17	0	17	5	17	11	18	4	18 10	19 3
3	—	22	8	23	5	24	1	24	9	25	5	26	2	26	10	27	6	28 2	28 11
4	—	30	3	31	2	32	1	33	0	33	11	34	10	35	9	36	8	37 7	38 6
5	—	37	10	39	0	40	1	41	3	42	5	43	7	44	8	45	10	47 0	48 2
6	—	45	5	46	9	48	2	49	6	50	11	52	3	53	8	55	0	56 5	57 9
—	1	0	8	0	8	0	8	0	8	0	8	0	9	0	9	0	9	0 9	0 10
—	2	1	3	1	4	1	4	1	5	1	5	1	5	1	6	1	6	1 7	1 7
—	3	1	11	1	11	2	0	2	1	2	1	2	2	2	3	2	4	2 4	2 5
—	6	3	9	3	11	4	0	4	2	4	3	4	4	4	6	4	7	4 8	4 10

Length		34 *Inches Wide, Deep, or Thick, — By*																	
ft.	*in.*	34 *in.*		35 *in.*		36 *in.*		37 *in.*		38 *in.*		39 *in.*		40 *in.*		41 *in.*		42 *in.*	43 *in.*
1	—	8	0	8	3	8	6	8	9	9	0	9	3	9	5	9	8	9 11	10 2
2	—	16	1	16	6	17	0	17	6	17	11	18	5	18	11	19	4	19 10	20 4
3	—	24	1	24	10	25	6	26	3	26	11	27	8	28	4	29	1	29 9	30 6
4	—	32	1	33	1	34	0	34	11	35	11	36	10	37	9	38	9	39 8	40 7
5	—	40	2	41	4	42	6	43	8	44	10	46	1	47	3	48	5	49 7	50 9
6	—	48	2	49	7	51	0	52	5	53	10	55	3	56	8	58	1	59 6	60 11
—	1	0	8	0	8	0	9	0	9	0	9	0	9	0	9	0	10	0 10	0 10
—	2	1	4	1	5	1	5	1	5	1	6	1	6	1	7	1	7	1 8	1 8
—	3	2	0	2	1	2	2	2	2	2	3	2	4	2	4	2	5	2 6	2 6
—	6	4	0	4	2	4	3	4	4	4	6	4	7	4	9	4	10	5 0	5 1

Length		35 *Inches Wide, Deep, or Thick, — By*																	
ft.	*in.*	35 *in.*		36 *in.*		37 *in.*		38 *in.*		39 *in*		40 *in.*		41 *in.*		42 *in.*		43 *in.*	44 *in.*
1	—	8	6	8	9	9	0	9	3	9	6	9	9	10	0	10	3	10 5	10 8
2	—	17	0	17	6	18	0	18	6	19	0	19	5	19	11	20	5	20 11	21 5
3	—	25	6	26	3	27	0	27	9	28	5	29	2	29	11	30	8	31 4	32 1
4	—	34	0	35	0	36	0	36	11	37	11	38	11	39	10	40	10	41 10	42 9
5	—	42	6	43	9	45	0	46	2	47	5	48	7	49	10	51	1	52 3	53 6
6	—	51	1	52	6	54	0	55	5	56	11	58	4	59	10	61	3	62 9	64 2
—	1	0	9	0	9	0	9	0	9	0	9	0	10	0	10	0	10	0 10	0 11
—	2	1	5	1	6	1	6	1	6	1	7	1	7	1	8	1	8	1 9	1 9
—	3	2	2	2	2	2	3	2	4	2	4	2	5	2	6	2	7	2 7	2 8
—	6	4	3	4	5	4	6	4	7	4	9	4	10	5	0	5	1	5 3	5 4

Length		36 *Inches Wide, Deep, or Thick, — By*																					
ft.	*in.*	36 *in.*		37 *in.*		38 *in.*		39 *in.*		40 *in.*		41 *in.*		42 *in.*		43 *in.*		44 *in.*		45 *in.*	
1	—	9	0	9	3	9	6	9	9	10	0	10	3	10	6	10	9	11	0	11	3
2	—	18	0	18	6	19	0	19	6	20	0	20	6	21	0	21	6	22	0	22	6
3	—	27	0	27	9	28	6	29	3	30	0	30	9	31	6	32	3	33	0	33	9
4	—	36	0	37	0	38	0	39	0	40	0	41	0	42	0	43	0	44	0	45	0
5	—	45	0	46	3	47	6	48	9	50	0	51	3	52	6	53	9	55	0	56	3
6	—	54	0	55	6	57	0	58	6	60	0	61	6	63	0	64	6	66	0	67	6
—	1	0	9	0	9	0	10	0	10	0	10	0	10	0	11	0	11	0	11	0	11
—	2	1	6	1	7	1	7	1	8	1	8	1	9	1	9	1	10	1	10	1	11
—	3	2	3	2	4	2	5	2	5	2	6	2	7	2	8	2	8	2	9	2	10
—	6	4	6	4	8	4	9	4	11	5	0	5	2	5	3	5	5	5	6	5	8

Length		37 *Inches Wide, Deep, or Thick, — By*																					
ft.	*in.*	37 *in.*		38 *in.*		39 *in.*		40 *in.*		41 *in.*		42 *in.*		43 *in.*		44 *in.*		45 *in.*		46 *in.*	
1	—	9	6	9	9	10	0	10	3	10	6	10	10	11	1	11	4	11	7	11	10
2	—	19	0	19	6	20	1	20	7	21	1	21	7	22	1	22	7	23	2	23	8
3	—	28	6	29	4	30	1	30	10	31	7	32	5	33	2	33	11	34	8	35	6
4	—	38	0	39	1	40	1	41	1	42	2	43	2	44	2	45	3	46	3	47	3
5	—	47	6	48	10	50	1	51	5	52	8	54	0	55	3	56	6	57	10	59	1
6	—	57	1	58	7	60	2	61	8	63	3	64	9	66	4	67	10	69	5	70	11
—	1	0	10	0	10	0	10	0	10	0	11	0	11	0	11	0	11	1	0	1	0
—	2	1	7	1	8	1	8	1	9	1	9	1	10	1	10	1	11	1	11	2	0
—	3	2	5	2	5	2	6	2	7	2	8	2	8	2	9	2	10	2	11	2	11
—	6	4	9	4	11	5	0	5	2	5	3	5	5	5	6	5	8	5	9	5	11

Length		38 *Inches Wide, Deep, or Thick, — By*																					
ft.	*in.*	38 *in.*		39 *in.*		40 *in.*		41 *in.*		42 *in.*		43 *in.*		44 *in*		45 *in.*		46 *in.*		47 *in.*	
1	—	10	0	10	4	10	7	10	10	11	1	11	4	11	7	11	11	12	2	12	5
2	—	20	1	20	7	21	1	21	8	22	2	22	8	23	3	23	9	24	3	24	10
3	—	30	1	30	11	31	8	32	6	33	3	34	1	34	10	35	8	36	5	37	3
4	—	40	1	41	2	42	3	43	3	44	4	45	5	46	5	47	6	48	7	49	7
5	—	50	2	51	6	52	9	54	1	55	5	56	9	58	1	59	5	60	8	62	0
6	—	60	2	61	9	63	4	64	11	66	6	68	1	69	8	71	3	72	10	74	5
—	1	0	10	0	10	0	11	0	11	0	11	0	11	1	0	1	0	1	0	1	0
—	2	1	8	1	9	1	9	1	10	1	10	1	11	1	11	2	0	2	0	2	1
—	3	2	6	2	7	2	8	2	8	2	9	2	10	2	11	3	0	3	0	3	1
—	6	5	0	5	2	5	3	5	5	5	7	5	8	5	10	5	11	6	1	6	2

Length		39 *Inches Wide, Deep, or Thick, — By*																					
ft.	*in*	39 *in.*		40 *in.*		41 *in.*		42 *in*		43 *in.*		44 *in.*		45 *in.*		46 *in.*		47 *in.*		48 *in.*	
1	—	10	7	10	10	11	1	11	5	11	8	11	11	12	2	12	6	12	9	13	0
2	—	21	2	21	8	22	3	22	9	23	4	23	10	24	5	24	11	25	6	26	0
3	—	31	8	32	6	33	4	34	2	34	11	35	9	36	7	37	5	38	2	39	0
4	—	42	3	43	4	44	5	45	6	46	7	47	8	48	9	49	10	50	11	52	0
5	—	52	10	54	2	55	6	56	11	58	3	59	7	60	11	62	4	63	8	65	0
6	—	63	5	65	0	66	8	68	3	69	11	71	6	73	2	74	9	76	5	78	0
—	1	0	11	0	11	0	11	0	11	1	0	1	0	1	0	1	0	1	1	1	1
—	2	1	9	1	10	1	10	1	11	1	11	2	0	2	0	2	1	2	1	2	2
—	3	2	8	2	9	2	9	2	10	2	11	3	0	3	1	3	1	3	2	3	3
—	6	5	3	5	5	5	7	5	8	5	10	6	0	6	1	6	3	6	4	6	6

Length		40 *Inches Wide, Deep, or Thick, — By*																			
ft	*in.*	40 *in.*		41 *in.*		42 *in.*		43 *in.*		44 *in.*		45 *in.*		46 *in.*		47 *in.*		48 *in.*		49 *in.*	
1	—	11	1	11	5	11	8	11	11	12	3	12	6	12	9	13	1	13	4	13	7
2	—	22	3	22	9	23	4	23	11	24	5	25	0	25	7	26	1	26	8	27	3
3	—	33	4	34	2	35	0	35	10	36	8	37	6	38	4	39	2	40	0	40	10
4	—	44	5	45	7	46	8	47	9	48	11	50	0	51	1	52	3	53	4	54	5
5	—	55	7	56	11	58	4	59	9	61	1	62	6	63	11	65	3	66	8	68	1
6	—	66	8	68	4	70	0	71	8	73	4	75	0	76	8	78	4	80	0	81	8
—	1	0	11	0	11	1	0	1	0	1	0	1	1	1	1	1	1	1	1	1	2
—	2	1	10	1	11	1	11	2	0	2	0	2	1	2	2	2	2	2	3	2	3
—	3	2	9	2	10	2	11	3	0	3	1	3	2	3	2	3	3	3	4	3	5
—	6	5	7	5	8	5	10	6	0	6	1	6	3	6	5	6	6	6	8	6	10

Length		41 *Inches Wide, Deep, or Thick, — By*																			
ft.	*in*	41 *in.*		42 *in.*		43 *in.*		44 *in.*		45 *in.*		46 *in.*		47 *in.*		48 *in.*		49 *in.*		50 *in.*	
1	—	11	8	12	0	12	3	12	6	12	10	13	1	13	5	13	8	13	11	14	3
2	—	23	4	23	11	24	6	25	1	25	8	26	2	26	9	27	4	27	11	28	6
3	—	35	0	35	11	36	9	37	7	38	5	39	4	40	2	41	0	41	10	42	9
4	—	46	8	47	10	49	0	50	1	51	3	52	5	53	6	54	8	55	10	56	11
5	—	58	4	59	10	61	3	62	8	64	1	65	6	66	11	68	4	69	9	71	2
6	—	70	1	71	9	73	6	75	2	76	11	78	7	80	4	82	0	83	9	85	5
—	1	1	0	1	0	1	0	1	1	1	1	1	2	1	2	1	2	1	2	1	2
—	2	1	11	2	0	2	0	2	1	2	2	2	2	2	3	2	3	2	4	2	4
—	3	2	11	3	0	3	1	3	2	3	2	3	3	3	4	3	5	3	6	3	7
—	6	5	10	6	0	6	1	6	3	6	5	6	7	6	8	6	10	7	0	7	1

Length		42 *Inches Wide, Deep, or Thick, — By*																			
ft.	*in.*	42 *in.*		43 *in.*		44 *in.*		45 *in.*		46 *in.*		47 *in.*		48 *in.*		49 *in.*		50 *in.*		51 *in.*	
1	—	12	3	12	7	12	10	13	2	13	5	13	9	14	0	14	4	14	7	14	11
2	—	24	6	25	1	25	8	26	3	26	10	27	5	28	0	28	7	29	2	29	9
3	—	36	9	37	8	38	6	39	5	40	3	41	2	42	0	42	11	43	9	44	8
4	—	49	0	50	2	51	4	52	6	53	8	54	10	56	0	57	2	58	4	59	6
5	—	61	3	62	9	64	2	65	8	67	1	68	7	70	0	71	6	72	11	74	5
6	—	73	6	75	3	77	0	78	9	80	6	82	3	84	0	85	9	87	6	89	3
—	1	1	0	1	1	1	1	1	1	1	1	1	2	1	2	1	2	1	3	1	3
—	2	2	1	2	1	2	2	2	2	2	3	2	3	2	4	2	5	2	5	2	6
—	3	3	1	3	2	3	3	3	3	3	4	3	5	3	6	3	7	3	8	3	9
—	6	6	2	6	3	6	5	6	7	6	9	6	10	7	0	7	2	7	4	7	5

Length		43 *Inches Wide, Deep, or Thick, — By*																			
ft.	*in.*	43 *in.*		44 *in.*		45 *in.*		46 *in.*		47 *in.*		48 *in.*		49 *in.*		50 *in.*		51 *in.*		52 *in.*	
1	—	12	10	13	2	13	5	13	9	14	0	14	4	14	8	14	11	15	3	15	6
2	—	25	8	26	3	26	11	27	6	28	1	28	8	29	3	29	10	30	6	31	1
3	—	38	6	39	5	40	4	41	3	42	1	43	0	43	11	44	10	45	8	46	7
4	—	51	4	52	7	53	9	54	11	56	2	57	4	58	6	59	9	60	11	62	1
5	—	64	2	65	8	67	2	68	8	70	2	71	8	73	2	74	8	76	2	77	8
6	—	77	1	78	10	80	8	82	5	84	3	86	0	87	10	89	7	91	5	93	2
—	1	1	1	1	1	1	1	1	2	1	2	1	2	1	3	1	3	1	3	1	3
—	2	2	2	2	2	2	3	2	3	2	4	2	5	2	5	2	6	2	6	2	7
—	3	3	3	3	3	3	4	3	5	3	6	3	7	3	8	3	9	3	10	3	10
—	6	6	5	6	7	6	9	6	10	7	0	7	2	7	4	7	6	7	7	7	9

Length		44 *Inches Wide, Deep, or Thick, — By*																	
ft.	*in.*	44 *in.*		45 *in.*		46 *in.*		47 *in.*		48 *in.*		49 *in.*		50 *in.*		51 *in.*		52 *in.*		53 *in.*	
1	—	13	5	13	9	14	1	14	4	14	8	15	00	15	3	15	7	15	11	16	2
2	—	26	11	27	6	28	1	28	9	29	4	29	11	30	7	31	2	31	9	32	5
3	—	40	4	41	3	42	2	43	1	44	0	44	11	45	10	46	9	47	8	48	7
4	—	53	9	55	0	56	3	57	5	58	8	59	11	61	1	62	4	63	7	64	9
5	—	67	3	68	9	70	3	71	10	73	4	74	10	76	5	77	11	79	5	81	0
6	—	80	8	82	6	84	4	86	2	88	0	89	10	91	8	93	6	95	4	97	2
—	1	1	1	1	2	1	2	1	2	1	3	1	3	1	3	1	3	1	4	1	4
—	2	2	3	2	4	2	4	2	5	2	5	2	6	2	7	2	7	2	8	2	8
—	3	3	4	3	5	3	6	3	7	3	8	3	9	3	10	3	11	4	0	4	1
—	6	6	9	6	11	7	0	7	2	7	4	7	6	7	8	7	10	7	11	8	1

Length		45 *Inches Wide, Deep, or Thick, — By*																	
ft	*in.*	45 *in.*		46 *in.*		47 *in.*		48 *in.*		49 *in.*		50 *in.*		51 *in.*		52 *in*		53 *in.*		54 *in.*	
1	—	14	1	14	5	14	8	15	0	15	4	15	8	15	11	16	3	16	7	16	11
2	—	28	2	28	9	29	5	30	0	30	8	31	3	31	11	32	6	33	2	33	9
3	—	42	2	43	2	44	1	45	0	45	11	46	11	47	10	48	9	49	8	50	8
4	—	56	3	57	6	58	9	60	0	61	3	62	6	63	9	65	0	66	3	67	6
5	—	70	4	71	11	73	5	75	0	76	7	78	2	79	8	81	3	82	10	84	5
6	—	84	5	86	3	88	2	90	0	91	11	93	9	95	8	97	6	99	5	101	3
—	1	1	2	1	2	1	3	1	3	1	3	1	4	1	4	1	4	1	5	1	5
—	2	2	4	2	5	2	5	2	6	2	7	2	7	2	8	2	9	2	9	2	10
—	3	3	6	3	7	3	8	3	9	3	10	3	11	4	0	4	1	4	2	4	3
—	6	7	0	7	2	7	4	7	6	7	8	7	10	8	0	8	2	8	3	8	5

Length		46 *Inches Wide, Deep, or Thick, — By*																	
ft.	*in.*	46 *in.*		47 *in.*		48 *in*		49 *in.*		50 *in.*		51 *in.*		52 *in.*		53 *in*		54 *in.*		55 *in.*	
1	—	14	8	15	0	15	4	15	8	16	0	16	4	16	7	16	11	17	3	17	7
2	—	29	5	30	0	30	8	31	4	31	11	32	7	33	3	33	10	34	6	35	2
3	—	44	1	45	1	46	0	47	0	47	11	48	11	49	10	50	10	51	9	52	9
4	—	58	9	60	1	61	4	62	7	63	11	65	2	66	5	67	9	69	0	70	3
5	—	73	6	75	1	76	8	78	3	79	10	81	6	83	1	84	8	86	3	87	10
6	—	88	2	90	1	92	0	93	11	95	10	97	9	99	8	101	7	103	6	105	5
—	1	1	3	1	3	1	3	1	4	1	4	1	4	1	5	1	5	1	5	1	6
—	2	2	5	2	6	2	7	2	7	2	8	2	9	2	9	2	10	2	10	2	11
—	3	3	8	3	9	3	10	3	11	4	0	4	1	4	2	4	3	4	4	4	5
—	6	7	4	7	6	7	8	7	10	8	0	8	2	8	4	8	5	8	8	8	9

Length		47 *Inches Wide, Deep, or Thick, — By*																	
ft.	*in.*	47 *in.*		48 *in.*		49 *in*		50 *in.*		51 *in.*		52 *in.*		53 *in.*		54 *in.*		55 *in.*		56 *in.*	
1	—	15	4	15	8	16	0	16	4	16	8	17	0	17	4	17	8	17	11	18	3
2	—	30	8	31	4	32	0	32	8	33	4	33	11	34	7	35	3	35	11	36	7
3	—	46	0	47	0	48	0	49	0	49	11	50	11	51	11	52	11	53	10	54	10
4	—	61	4	62	8	64	0	65	3	66	7	67	11	69	2	70	6	71	10	73	1
5	—	76	8	78	4	80	0	81	7	83	3	84	10	86	6	88	2	89	9	91	5
6	—	92	1	94	0	96	0	97	11	99	11	101	10	103	10	105	9	107	9	109	8
—	1	1	3	1	4	1	4	1	4	1	5	1	5	1	5	1	6	1	6	1	6
—	2	2	7	2	7	2	8	2	9	2	9	2	10	2	11	2	11	3	0	3	1
—	3	3	10	3	11	4	0	4	1	4	2	4	3	4	4	4	5	4	6	4	7
—	6	7	8	7	10	8	0	8	2	8	4	8	6	8	8	8	10	9	1	9	2

Length		48 *Inches Wide, Deep, or Thick, — By*															
ft.	*in.*	48 *in.*		49 *in.*		50 *in.*		51 *in.*		52 *in.*		53 *in.*		54 *in.*		55 *in.*		56 *in.*		57 *in.*	
1	—	16	0	16	4	16	8	17	0	17	4	17	8	18	0	18	4	18	8	19	0
2	—	32	0	32	8	33	4	34	0	34	8	35	4	36	0	36	8	37	4	38	0
3	—	48	0	49	0	50	0	51	0	52	0	53	0	54	0	55	0	56	0	57	0
4	—	64	0	65	4	66	8	68	0	69	4	70	8	72	0	73	4	74	8	76	0
5	—	80	0	81	8	83	4	85	0	86	8	88	4	90	0	91	8	93	4	95	0
6	—	96	0	98	0	100	0	102	0	104	0	106	0	108	0	110	0	112	0	114	0
—	1	1	4	1	4	1	5	1	5	1	5	1	6	1	6	1	6	1	7	1	7
—	2	2	8	2	9	2	9	2	10	2	11	2	11	3	0	3	1	3	1	3	2
—	3	4	0	4	1	4	2	4	3	4	4	4	5	4	6	4	7	4	8	4	9
—	6	8	0	8	2	8	4	8	6	8	8	8	10	9	0	9	3	9	4	9	6

Length		49 *Inches Wide, Deep, or Thick, —By*											
ft.	*in.*	49 *in.*		50 *in.*		51 *in.*		52 *in.*		53 *in.*		54 *in.*	
1	—	16	8	17	0	17	4	17	8	18	0	18	5
2	—	33	4	34	0	34	9	35	5	36	1	36	9
3	—	50	0	51	1	52	1	53	1	54	1	55	2
4	—	66	8	68	1	69	5	70	9	72	2	73	6
5	—	83	4	85	1	86	9	88	6	90	2	91	11
6	—	100	1	102	1	104	2	106	2	108	3	110	3
—	1	1	5	1	5	1	5	1	6	1	6	1	6
—	2	2	9	2	10	2	11	2	11	3	0	3	1
—	3	4	2	4	3	4	4	4	5	4	6	4	7
—	6	8	4	8	6	8	8	8	10	9	0	9	2

Length		50 *Inches Wide, Deep, or Thick, — By*									
ft.	*in.*	50 *in.*		51 *in.*		52 *in.*		53 *in.*		54 *in.*		55 *in.*	
1	—	17	4	17	9	18	1	18	5	18	9	19	1
2	—	34	9	35	5	36	1	36	10	37	6	38	2
3	—	52	1	53	2	54	2	55	3	56	3	57	4
4	—	69	5	70	10	72	3	73	7	75	0	76	5
5	—	86	10	88	7	90	3	92	0	93	9	95	6
6	—	104	2	106	3	108	4	110	5	112	6	114	7
—	1	1	5	1	6	1	6	1	6	1	7	1	7
—	2	2	11	2	11	3	0	3	1	3	2	3	2
—	3	4	4	4	5	4	6	4	7	4	8	4	9
—	6	8	8	8	10	9	0	9	2	9	5	9	7

Length		51 *Inches Wide, Deep, or Thick, — By*									
ft.	*in.*	51 *in.*		52 *in.*		53 *in.*		54 *in.*		55 *in.*		56 *in.*	
1	—	18	1	18	5	18	9	19	2	19	6	19	10
2	—	36	2	36	10	37	7	38	3	39	0	39	8
3	—	54	2	55	3	56	4	57	5	58	5	59	6
4	—	72	3	73	8	75	1	76	6	77	11	79	4
5	—	90	4	92	1	93	10	95	8	97	5	99	2
6	—	108	5	110	6	112	8	114	9	116	11	119	0
—	1	1	6	1	6	1	7	1	7	1	7	1	8
—	2	3	0	3	1	3	2	3	2	3	3	3	4
—	3	4	6	4	7	4	8	4	9	4	10	5	0
—	6	9	0	9	3	9	5	9	7	9	9	9	11

Length		52 *Inches Wide, Deep, or Thick, — By*											
ft.	*in.*	52 *in.*		53 *in.*		54 *in.*		55 *in.*		56 *in.*		57 *in.*	
1	—	18	9	19	2	19	6	19	10	20	3	20	7
2	—	37	7	38	3	39	0	39	9	40	5	41	2
3	—	56	4	57	5	58	6	59	7	60	8	61	9
4	—	75	1	76	7	78	0	79	5	80	11	82	4
5	—	93	11	95	8	97	6	99	4	101	1	102	11
6	—	112	8	114	10	117	0	119	2	121	4	123	6
—	1	1	7	1	7	1	8	1	8	1	8	1	9
—	2	3	2	3	2	3	3	3	4	3	4	3	5
—	3	4	8	4	9	4	11	5	0	5	1	5	2
—	6	9	5	9	7	9	9	9	11	10	1	10	4

Length		53 *Inches Wide, Deep, or Thick, — By*											
ft.	*in.*	53 *in.*		54 *in.*		55 *in.*		56 *in.*		57 *in.*		58 *in.*	
1	—	19	6	19	11	20	3	20	7	21	0	21	4
2	—	39	0	39	9	40	6	41	3	42	0	42	8
3	—	58	6	59	8	60	9	61	10	62	11	64	1
4	—	78	0	79	6	81	0	82	5	83	11	85	5
5	—	97	6	99	5	101	3	103	1	104	11	106	9
6	—	117	1	119	3	121	6	123	8	125	11	128	1
—	1	1	8	1	8	1	8	1	9	1	9	1	9
—	2	3	3	3	4	3	4	3	5	3	6	3	8
—	3	4	11	5	0	5	1	5	2	5	3	5	7
—	6	9	9	9	11	10	1	10	4	10	6	10	4

The following Rules are applicable to cases where the Tables do not show the dimensions of a Package.

If the Length of a Box or Package is in Feet and Inches, add or deduct the *Inches*, found at the foot of the Table. Supposing a Box, 3 feet 3 inches long, *add* the 3 *inches*, but if 3 feet 9 inches long, then *deduct* 3 inches from 4 feet

If a Package exceed 6 feet in length, add together the *products* opposite any two lengths, or take twice one length.

Thus: — If a Package is 9 feet long and 20 inches by 20, *add* together the *products* opposite 4 and 5 Feet and under 20 Inches; and so of any other length.

Or, if the Depth or Breadth of a Package cannot be found in the Tables, add the *products* of two breadths together, or, take twice one breadth.

Thus: — If a Package is 3 feet long and 21 by 36 inches, turn to the Table headed with *half* of the largest number and *double* the *product* opposite 3 feet and under 21 Inches. — Or, if the breadth is an odd number (say 37 inches) then add together the *products* opposite 3 feet and under 21 inches in Tables 18 & 19.

Or, if a Package is 6 feet long and 48 by 60 inches, turn to the Table which contains half of both numbers in inches, and *multiply by* 4 the *product* opposite 6 feet and under 30 inches. So, if a Package is 8 feet by 8 feet and 6 inches. And so of any Box or Package of larger or smaller dimensions.

Fractions of less than an inch are not noticed, and when half an inch or over, they are counted as one inch.

To Measure Solid Feet.

Multiply the *length* in Inches by the *breadth* in Inches, and the product by the depth in feet, and divide by 144.

Example. — A package is 58 inches broad, 54 inches deep, and 8 feet long; then

$$58 \times 54 = 3132 \times 8 = 25056 \div 144 = 174 \textit{ Solid Feet.}$$

And if all the dimensions are in inches, then

$$96 \times 58 = 5568 \times 54 = 300672 \div 1728 = 174 \textit{ Solid Feet.}$$

SHIPPER'S AND MATE'S EXPEDITIOUS CASK MEASURER.

These Tables show the Solid Contents of Hogsheads, Casks, Barrels, &c. In measuring Casks it is usual to deduct *one fifth* from the Solid Contents on account of the Bulge. *Thus:* — If a cask is 3 feet long and 28 by 28 inches, it will be seen, by the preceding pages, that its Solid Contents are 16 feet and 1 inch, but with *one fifth* off only 13 feet and 1 inch.

TABLE No. 1.

Length.		8 by 8	9 by 9	10 by 10	11 by 11	12 by 12	13 by 13
feet.	*in.*	*ft. in*	*ft. in.*	*ft. in.*	*ft. in.*	*ft. in.*	*ft. in.*
1	—	0 4	0 5	0 7	0 8	0 10	0 11
2	—	0 9	0 11	1 1	1 4	1 7	1 11
3	—	1 1	1 4	1 8	2 0	2 5	2 10
4	—	1 5	1 10	2 3	2 8	3 2	3 9
5	—	1 9	2 3	2 9	3 4	4 0	4 8
6	—	2 2	2 8	3 4	4 0	4 10	5 8
—	1	0 0	0 0	0 0	0 0	0 1	0 1
—	2	0 0	0 1	0 1	0 1	0 2	0 2
—	3	0 1	0 1	0 2	0 2	0 2	0 3
—	6	0 2	0 3	0 3	0 4	0 5	0 6

TABLE No. 2.

Length.		14 by 14	15 by 15	16 by 16	17 by 17	18 by 18	19 by 19
feet.	*in.*	*ft. in.*	*ft. in.*	*ft. in.*	*ft. in*	*ft. in.*	*ft. in.*
1	—	1 1	1 3	1 5	1 7	1 10	2 0
2	—	2 2	2 6	2 10	3 3	3 7	4 0
3	—	3 3	3 9	4 3	4 10	5 5	6 0
4	—	4 4	5 0	5 8	6 5	7 2	8 0
5	—	5 5	6 3	7 1	8 0	9 0	10 0
6	—	6 6	7 6	8 6	9 8	10 10	12 0
—	1	0 1	0 1	0 1	0 2	0 2	0 2
—	2	0 2	0 2	0 3	0 3	0 4	0 4
—	3	0 3	0 4	0 4	0 5	0 5	0 6
—	6	0 7	0 7	0 9	0 10	0 11	1 0

TABLE No. 3.

Length.		20 by 20	21 by 21	22 by 22	23 by 23	24 by 24	25 by 25
feet.	*in*	*ft. in.*	*ft. in.*	*ft. in.*	*ft. in.*	*ft. in.*	*ft. in.*
1	—	2 2	2 6	2 8	2 11	3 2	3 6
2	—	4 5	4 11	5 5	5 11	6 5	6 11
3	—	6 8	7 4	8 1	8 10	9 7	10 5
4	—	8 11	9 10	10 9	11 9	12 10	13 11
5	—	11 1	12 3	13 5	14 9	16 0	17 4
6	—	13 4	14 8	16 2	17 8	19 2	20 10
—	1	0 2	0 2	0 3	0 3	0 3	0 3
—	2	0 4	0 5	0 5	0 6	0 6	0 7
—	3	0 7	0 7	0 8	0 9	0 10	0 10
—	6	1 1	1 3	1 4	1 6	1 7	1 8

TABLE No. 4.

Length.		26 by 26	27 by 27	28 by 28	29 by 29	30 by 30	31 by 31
feet.	*in.*	*ft. in.*	*ft. in.*	*ft. in.*	*ft. in.*	*ft. in.*	*ft. in.*
1	—	3 9	4 1	4 4	4 8	5 0	5 4
2	—	7 6	8 0	8 8	9 4	10 0	10 8
3	—	11 3	12 2	13 1	14 0	15 0	16 0
4	—	15 0	16 2	17 5	18 8	20 0	21 4
5	—	18 9	20 3	21 9	23 4	25 0	26 8
6	—	22 6	24 4	26 2	28 0	30 0	32 0
—	1	0 4	0 4	0 4	0 5	0 5	0 5
—	2	0 7	0 8	0 9	0 9	0 10	0 11
—	3	0 11	1 0	1 1	1 2	1 3	1 4
—	6	1 11	2 0	2 2	2 4	2 6	2 8

TABLE No. 5.

Length.		32 by 32	33 by 33	34 by 34	35 by 35	36 by 36	37 by 37
feet.	*in.*	*ft. in.*	*ft. in.*	*ft. in.*	*ft. in.*	*ft. in.*	*ft. in.*
1	—	5 8	6 0	6 4	6 9	7 2	7 7
2	—	11 4	12 1	12 10	13 7	14 5	15 2
3	—	17 1	18 2	19 3	20 5	21 7	22 10
4	—	22 9	24 2	25 8	27 3	28 10	30 5
5	—	28 5	30 3	32 1	34 0	36 0	38 0
6	—	34 2	36 4	38 6	40 10	43 2	45 8
—	1	0 6	0 6	0 6	0 7	0 7	0 8
—	2	0 11	1 0	1 1	1 2	1 2	1 3
—	3	1 5	1 6	1 7	1 8	1 10	1 11
—	6	2 10	3 0	3 2	3 5	3 7	3 10

TABLE No. 6.

Length.		38 by 38	39 by 39	40 by 40	41 by 41	42 by 42	43 by 43
feet.	*in.*	*ft. in.*	*ft. in.*	*ft. in.*	*ft. in.*	*ft. in.*	*ft. in.*
1	—	8 0	8 5	8 10	9 4	9 9	10 3
2	—	16 0	16 11	17 8	18 8	19 7	20 6
3	—	24 0	25 4	26 8	28 0	29 5	30 9
4	—	32 1	33 10	35 7	37 4	39 2	41 1
5	—	40 1	42 3	44 5	46 8	49 0	51 4
6	—	48 2	50 8	53 4	56 0	58 10	61 8
—	1	0 8	0 8	0 9	0 9	0 10	0 10
—	2	1 4	1 5	1 6	1 7	1 8	1 9
—	3	2 0	2 1	2 3	2 4	2 5	2 7
—	6	4 0	4 3	4 5	4 8	4 11	5 2

TABLE No. 7.

Length.		44 by 44		45 by 45		46 by 46		47 by 47		48 by 48		49 by 49	
feet.	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*
1	—	10	8	11	3	11	8	12	3	12	9	13	4
2	—	21	6	22	6	23	6	24	6	25	7	26	8
3	—	32	3	33	8	35	3	36	8	38	5	40	0
4	—	43	0	45	0	47	0	49	1	51	2	53	4
5	—	53	9	56	3	58	9	61	4	64	0	66	8
6	—	64	6	67	6	70	6	73	8	76	10	80	0
—	1	0	11	0	11	1	0	1	0	1	1	1	1
—	2	1	9	1	10	1	11	2	1	2	2	2	3
—	3	2	8	2	10	2	11	3	1	3	3	3	4
—	6	5	4	5	7	5	10	6	2	6	6	6	8

NOTE.— If the Length of a Cask or Package is in Feet and Inches, add or deduct the *Inches* Suppose a Cask, 3 feet 3 inches long, *add* the 3 *inches*; but if 3 feet 9 inches long, *deduct* 3 inches from 4 feet.

PROPORTION OF ALCOHOL IN 100 PARTS OF THE FOLLOWING LIQUORS. — *Prof. Brande.*

Scotch Whiskey	54·53	Currant Wine	20·50
Irish do.	53·9	Port	22·90
Rum	53 68	Madeira	22·27
Gin	51·6	Teneriffe	19·79
Brandy	53 39	Sherry	19·17
Burgundy	14.57	Claret	15·1
Cape Muscat	18·25	Elder	8·79
Champagne (still)	13·80	Ale	6·87
" (sparkling)	12·61	Porter	4·2
Cider	9·8 to 5·2	Malaga	17·26
Constantia	19·75	Rhenish	12·08
Gooseberry Wine	11·84	Small Beer	1·28

LAWS OF THE UNITED STATES.

No Distilled Spirits, except Arrack, Brandy in casks of not less than 15 galls., and sweet cordial, can be imported in casks or vessels of less capacity than 90 gallons, wine measure, nor in casks which have been marked pursuant to any law of the United States, on pain of forfeiture of the same, with the vessel.

No Beer, Ale, or Porter, can be imported in vessels of less than 40 gallons, or if in bottles, in packages of less than 6 dozen, under the penalty of forfeiture.

MISCELLANEOUS WEIGHTS AND MEASURES.

Bag of Hops,	about 2¼ cwt.	Raisins, Malaga, cask of,	1 cwt.
" Rice, (E. I.)	about 1½ "	" " box of,	25 lbs.
Bale of Coffee, (Moc.)	2 to 2½ "	" " ¼ "	12½ "
Box of Salmon,	120 to 130 lbs.	" " ⅛ "	6¼ "
Case of Mace,	about 1½ cwt.	Sack of Flour,	280 lbs.
Cask of Clover,	from 7 to 9 "	Seron of Almonds,	1½ to 2 cwt.
Soap, box of	75 lbs.	Tierce of Coffee,	5 to 7 "
Ginger, box, ground,	25 lbs.	Tub of Butter,	84 lbs.
Firkin of Beef,	100 "	Quintal of Fish,	112 lbs.
" Butter,	56 "	Quire of Paper,	24 sheets.
Hogshead of Beer,	54 galls.	Ream of Paper, 20 quires,	480 "
" of Indian Meal,	800 lbs.	Brandy, pipe of,	about 130 galls.
Lemons, box of Sicily, about	350	" half pipe of	86 "
Oranges, do. do. single O	175 to 225	Gin, pipe of,	about 125 "
Oranges, do. do. double O	300 to 350	Port Wine, pipe of,	140 "
Puncheon of Prunes, Imp'ls,	1120 lbs.	Molasses, hhd. of,	fr. 130 to 150 "

STOWAGE OF MIXED CARGOES.

[PREPARED BY H. C. CHAPMAN & CO. AGENTS FOR LLOYD'S, LIVERPOOL.]

Instructions to Commanders and Mates. Recommended by the Committee for Managing the Affairs of Lloyd's.

1.—*Owners*, *Commanders*, and *Mates* of Ships, are considered in law in the same situation as *Common Carriers*, it is therefore necessary that all due precautions be taken to receive and stow Cargoes in good order, and deliver the same in like good order. The law holds the Shipowner liable for the safe custody of the Goods when properly and legally received on board in good order, and for the "delivery," to parties producing the Bill of Lading. The Captain's blank Bill of Lading should be receipted by the Warehouse Keeper or person authorized to receive the contents. Goods are not unfrequently sent alongside in a damaged state, and letters of indemnity given to the Captain by the Shippers for signing in good order and condition; this is nothing more or less than conniving at fraud; fine Goods are also often damaged in the Ship's hold, by Lumpers, if permitted to use Cotton Hooks in handling Bales. All Goods must be received on board according to the custom of the Port where the Cargo is to be taken in, and the same custom will regulate the commencement of the responsibility of the Master and Owners.

2. — HEMP, FLAX, WOOL, and COTTON should be dunnaged 9 inches on the Floors, and to the *upper part* of the *bilge*, the wing bales of the second tier kept 6 inches off the side at the lower corner, and 2 1-2 inches at the sides. Sand or damp gravel Ballast to be covered with boards. Pumps to be frequently sounded and attended to. *Sharp-bottomed Ships one-third less dunnage in floor and bilges.* Avoid Horn Shavings as dunnage from Calcutta.

3. — All CORN, WHEAT, RICE, PEASE, BEANS, &c., when in bulk, to be stowed on a good high platform, or dunnage wood, of not less than 10 inches, and in the bilges 14 inches dunnage; the pumps and masts cased, to have strong bulkheads, good shifting boards, with feeders and ventilators, and to have no admixture of other Goods. Flat-floored, wall-sided ships should be fitted with Bilge Pumps. On no consideration must the Staunchions under the Beams be removed.

4. — OIL WINE, SPIRITS, BEER, MOLASSES, TAR, &c., to be stowed bung up; to have good *cross beds* at the quarters, (*and not to trust to hanging beds*,) to be well chocked with wood, and allowed to stow three heights of pipes or butts, four heights of puncheons, and six heights of hogsheads or half-puncheons. All Moist Goods and Liquids, such as SALTED HIDES, Bales of BACON, BUTTER, LARD, GREASE, CASTOR OIL, &c., should not be stowed too near "Dry Goods," whose nature is to absorb moisture. Shipowners have often to pay heavy damages for Leakage in Casks of Molasses, arising from stowing too many heights without an intervening platform or 'twixt decks. From Bengal Goods also are frequently damaged by Castor Oil.

5.—TEA and FLOUR, in barrels; FLAX, CLOVER and LINSEED or RICE, in tierces; COFFEE and COCOA, in bags, should always have 9 inches, at least, of good dunnage in the bottom, and 14 to the upper part of the bilges, with 2½ inches at the sides: allowed to stow six heights of tierces, and eight heights of barrels. All Ships above 600 tons should have 'twixt decks or platforms laid for these cargoes, to ease the pressure — caulked 'twixt decks should have scuppers in the sides, and 2½ inches of dunnage laid athwart ship, and not fore-and-aft ways, when in Bags or Sacks; and when in Boxes or Casks, not less than one inch. RICE from Calcutta is not unfrequently damaged by Indigo, for want of care in stowing.

6. — Entire Cargoes of SUGAR, SALTPETRE, and GUANO, in bags, must have the dunnage carefully attended to, as laid down for other goods. TIMBER Ships are better without 'twixt decks if loading all Timber or Deals. Brown Sugar to be kept separate from White Sugar, and both kept from direct contact with Saltpetre.

7. — Pot and Pearl ASHES, TOBACCO, BARK, INDIGO, MADDER, GUMS, &c., whether in Casks, Cases, or Bales, to be dunnaged in the bottom, and to the upper part of the bilges, at *least* 9 inches, and 2½ inches at the sides.

8. — MISCELLANEOUS GOODS, such as boxes of Cheese, Kegs and Tubs of Lard, or other small or slight-made packages, not intended for broken stowage, should be stowed by themselves, and dunnaged as other goods.

9. — Barrels of PROVISIONS, and Tallow Casks, allowed to stow six heights. All METALS should be stowed under, and separated from, goods liable to be damaged by contact

10.— ALL MANUFACTURED GOODS, also Dry Hides, Bales of Silk, or other valuable articles, should have 2½ inches of dunnage against the side, to preserve a water-course. Bundles of SHEET IRON, RODS, Pigs of COPPER or IRON, or any rough hard substance, should not be allowed to come in contact with Bales or Bags, or any soft packages liable to be chafed. When Mats can be procured they should be used at the sides for Silk, Tea, &c.

11. — TAR, TURPENTINE, ROSIN, &c., to have flat Beds of Wood under the quarters, of an inch thick, and allowed to stow six heights.

12. — Very frequent and serious loss falls on Merchants on the upper part of Cargoes, particularly in vessels that bring Wheat, Corn, Tobacco, Oil Cake, &c., arising from vapor damage imbibed by Wheat, Flour, and other goods, stowed in the same vessel with Turpentine, or other strong-scented articles; the shippers are to blame for such negligence, for not making inquiry before shipping.

13. — Ships laden with full Cargoes of Coal, bound round Cape Horn, or Cape of Good Hope, to be provided with approved Ventilators as a preventive against ignition.

14. — No vessel bound on any over-sea voyage, should on any account be loaded beyond that point of immersion which will present a clear side out of water, when upright, of three inches to every foot depth of hold, measured amidships, from the height of the deck at the side, to the water.

GUAGING OF CASKS.

In taking the dimensions of a Cask it must be carefully observed: 1st, That the bung-hole be in the middle of the cask; 2d, That the bung-stave, and the stave opposite to the bung-hole, are both regular and even within; 3d, That the heads of the Cask are equal, and truly circular; if so, the distance between the inside of the chime to the outside of the opposite stave will be the head diameter within the Cask, very near.

RULE. — Take, in inches, the *inside* diameters of a Cask at the Head and the Bung, and also the Length; subtract the head-diameter from the bung-diameter, and note the difference.

If the measure of the Cask is taken outside, with callipers, from head to head, then a deduction must be made of from 1 to 2 inches for the thickness of the heads, according to the size of the Cask.

1. *If the staves of the Cask, between the bung and the head, are considerably curved,* (the shape of a Pipe), multiply the difference between the bung and head, by .7.

2. *If the staves be of a medium curve,* (the shape of a Molasses Hogshead), multiply the difference by .65.

3. *If the staves curve very little,* (less than a Molasses Hogshead), multiply the difference by .6.

4. *If the staves are nearly straight,* (almost a Cylinder), multiply the difference by .55.

5. *If the staves are similar to a* Port Wine Pipe, multiply by .73.

6. Add the product, in each case, to the head-diameter; the sum will be a mean diameter, and thus the Cask is reduced to a cylinder.

7. Multiply the *mean* diameter by itself, and then by the length, and multiply if for Wine gallons, by .0034. The difference of dividing by 294 (the usual method), and multiplying by .0034 (the most expeditious method), is less than 500ths of a gallon in 100 gallons.

EXAMPLE.

Supposing the Head-Diameter of a Cask to be 24 inches, the Bung-Diameter 32 inches, and the Length of Cask 40 inches; What is the content in Wine Gallons? *1st variety.*

Bung-Diameter,	32	brought up	876.16
Head-Diameter,	24	Length,	40
Difference,	8		35046.40
Multiplier,	.7		.0034
	5.6		14018560
Head-Diam.,	24		10513920
multiply	29.6		119.157760
by	29.6		
carry up Square,	876 16	*Ans.*	119 galls. 1 pint.

To obtain the contents of a similar Cask in Ale Gallons, multiply 35046.40 by .002785, and we get 97.6042, (or 97 gallons 5 pints.)

GUAGING OF CASKS IN IMPERIAL (BRITISH) GALLONS. AND ALSO IN UNITED STATES GALLONS.

Having ascertained the *variety* of the Cask, and its *interior* dimensions, the following Table will facilitate the calculation of its capacity.

Table of the Capacities of Casks, whose Bung Diameters and Lengths are 1 or Unity.

H.	1st Var.	2d Var.	3d Var.	4th Var.	H.	1st Var.	2d Var.	3d Var.	4th Var.
.50	.0021244	.0020300	.0017704	.0016523	.76	.0024337	.0024120	.0022343	.0022071
.51	.0021310	.0020433	.0017847	.0016713	.77	.0024482	.0024282	.0022560	.0022310
.52	.0021437	.0020567	.0017993	.0016905	.78	.0024628	.0024445	.0022780	.0022551
.53	.0021536	.0020702	.0018141	.0017098	.79	.0024777	.0024610	.0023002	.0022794
.54	.0021637	.0020838	.0018293	.0017294	.80	.0024927	.0024776	.0023227	.0023038
.55	.0021740	.0020975	.0018447	.0017491	.81	.0025079	.0024942	.0023455	.0023285
.56	.0021845	.0021114	.0018604	.0017690	.82	.0025233	.0025110	.0023686	.0023533
.57	.0021951	.0021253	.0018764	.0017891	.83	.0025388	.0025279	.0023920	.0023783
.58	.0022060	.0021394	.0018927	.0018094	.84	.0025546	.0025449	.0024156	.0024035
.59	.0022170	.0021536	.0019093	.0018299	.85	.0025706	.0025621	.0024396	.0024289
.60	.0022283	.0021679	.0019261	.0018506	.86	.0025867	.0025793	.0024638	.0024545
.61	.0022397	.0021823	.0019433	.0018715	.87	.0026030	.0025967	.0024883	.0024803
.62	.0022513	.0021968	.0019607	.0018925	.88	.0026196	.0026141	.0025131	.0025063
.63	.0022631	.0022114	.0019784	.0019138	.89	.0026363	.0026317	.0025381	.0025324
.64	.0022751	.0022262	.0019964	.0019352	.90	.0026532	.0026494	.0025635	.0025588
.65	.0022873	.0022410	.0020147	.0019568	.91	.0026703	.0026672	.0025891	.0025853
.66	.0022997	.0022560	.0020332	.0019786	.92	.0026875	.0026851	.0026150	.0026120
.67	.0023122	.0022711	.0020521	.0020006	.93	.0027050	.0027032	.0026412	.0026389
.68	.0023250	.0022863	.0020712	.0020228	.94	.0027227	.0027213	.0026677	.0026660
.69	.0023379	.0023016	.0020906	.0020452	.95	.0027405	.0027396	.0026945	.0026933
.70	.0023510	.0023170	.0021103	.0020678	.96	.0027585	.0027579	.0027215	.0027208
.71	.0023643	.0023326	.0021302	.0020905	.97	.0027768	.0027764	.0027489	.0027484
.72	.0023778	.0023482	.0021505	.0021135	.98	.0027952	.0027950	.0027765	.0027763
.73	.0023915	.0023640	.0021710	.0021366	.99	.0028138	.0028137	.0028044	.0028043
.74	.0024054	.0023799	.0021918	.0021599	1.00	.0028326	.0028326	.0028326	.0028326
.75	.0024195	.0023959	.0022129	.0021834					

Divide the head by the bung diameter, and opposite the quotient in the column H, and under its proper variety, is the tabular number for unity. Multiply the tabular number by the square of the bung diameter of the given cask, and by its length, the product equals its capacity in Imperial gallons.

Required the number of Gallons in a Cask, (*1st variety*,) 24 inches head diameter, 32 bung diameter, and 40 inches in length?

32) 24.0 (.75 see Table for tabular No.
.0024195 tabular No. for unity.
32 × 32 is 1024 square of bung diam.

96780
48390
24195

2.4775680
40 Inches long.

99.1027200 Imperial Gallons.
1.2

1982054400
991027200

118.92326400 United States Gallons.

NOTE. — Multiplying Imperial gallons by one & two-tenths (1.2) will convert them into U. S. gallons; and U. S. gallons multiplied by ·833 equal Imperial gallons.

TO ULLAGE, OR FIND THE CONTENTS IN GALLONS OF A CASK PARTLY FILLED.

To find the contents of the occupied part of a lying cask in gallons.

RULE.—Divide the depth of the liquid, or wet inches, by the bung diameter, and if the quotient is under .5 deduct from the quotient *one-fourth* of what it is less than .5, and multiply the remainder, by the whole capacity of the cask, this product will be the number of gallons in the cask. But if the quotient exceeds .5, add *one-fourth* of that excess to the quotient, and multiply the sum, by the whole capacity of the cask, this product will be the number of gallons.

EXAMPLE I.—Suppose the bung-diameter of a cask, on its bilge, is 32 inches, and the whole contents of the cask 118.80 U. S. standard gallons; required the ullage of 15 wet inches.

32) 15.00 (.46875 .5 — .46875 = .03125 ÷ 4 = .0078125 .46875 — .0078125 = .4609375 × 118.80 = 54.759375 U. S. Gallons.

EXAMPLE II.—Required the ullage of 17 wet inches in a cask of the above capacity?

32) 17.00 (.53125 — .5 = .03125 ÷ 4 = .0078125 + .53125 = .5390625 × 118.80 = 64.040625 U. S. Gallons.

PROOF — 64·040625 + 54·759375 = 118·80 *gallons.*

To find the ullage of a filled part of a standing Cask, in gallons.

RULE.—Divide the depth of the liquid, or wet inches, by the length of the cask; then, if the quotient is less than .5, deduct from the quotient *one-tenth* of what it is less than .5 and multiply the remainder, by the whole capacity of the cask, this product will be the number of gallons. But if the quotient exceeds .5, add *one-tenth* of that excess to the quotient, and multiply the sum, by the whole capacity of the cask, this product will be the ullage, or contents in U. S. standard gallons.

EXAMPLE.—Suppose a cask, 40 inches in length, and the capacity 118.80 gallons, as above: required the ullage of 21 wet inches?

40) 21.000 (.525 — .5 = .025 ÷ 10 = .0025 + .525 = .5275 × 118.80 = 62.667 U. S. Gallons.

NOTE.—Formerly the British Wine and Ale Gallon measures were similar to those now used in the United States and British Colonies.

The following Tables exhibit the comparative value between the United States and the present British measures.

U. S. measure for wine, spirits, &c.		British (Im.) measure. galls.	qts.	pts.	gills.	U. S. measure for ale and beer.		British (Im.) measure. galls.	qts.	pts.	gills.
42 galls.	= 1 tierce,	= 34	3	1	3	9 galls.	= 1 firkin,	= 9	0	1	1
63	= 1 hogsh.	= 52	1	1	3	36	= 1 barrel,	= 36	2	0	3
126	= 1 pipe,	= 104	3	1	3	54	= 1 hogsh.	= 54	3	1	1
252	= 1 tun,	= 209	3	1	2	108	= 1 butt,	= 109	3	0	3

To convert Imperial Gallons into United Standard Gallons multiply the imperial by 1·2. To convert U. S. Gallons into Imperial multiply the U. States standard gallons by ·833.

51 U. S. Ale Gallons equal 60 Imperial Gallons, therefore to convert one into other add or deduct 1-60th.

CAPACITY IN GALLONS OF SHIPS' WATER TANKS.

Showing the Capacity in Gallons and Decimal parts of Gallons, of Ship's Water Tanks, Cisterns, Wells, Reservoirs, &c., from 3 to 20 feet in *Diameter*, and from 4 to 6 feet, or to any *Depth*, — by adding together the products of any two lengths, or doubling or multiplying any one length. Suppose a Ship's Water-tank, or a Cistern, is 4 feet in diameter, and 9 feet in length, then opposite 4 in the left hand column, and under 4 and 5 is found 376. and 470., which sums added together make 846 gallons; if 16 feet in length, then 376. multiplied by 4 equals 1504. gallons.
The 1st col. gives the diameters, and the tops of the columns the lengths.

D.	Length.	Length.	Length.	Length.	Length.	Length.	Length	Length.	Length.
ft.	4 *ft.*	4¼ *ft.*	4½ *ft.*	4¾ *ft.*	5 *ft.*	5¼ *ft.*	5½ *ft.*	5¾ *ft.*	6 *ft.*
3	211.5	224.7	237 9	251 1	264.3	277.6	290.	304.	317.2
3¼	248 2	263.7	279 2	294.7	310.2	325 7	341.3	356.8	372.3
3½	287.8	305.8	323.8	341.8	359.8	377.8	395.8	413.8	431.8
3¾	330 4	351.1	371.7	392.4	413.1	436.7	454.4	475.	495.7
4	376.	399 5	423.	446 5	470.	493 5	517.	540.5	564.0
4¼	424.4	451.	477.5	504.	530.6	557.1	583 6	610.1	636.7
4½	475.8	505.6	535.3	565.1	594.8	624.6	654.3	684	713.8
4¾	530.2	563.3	596.5	629.6	662.7	695·9	729.	762.2	795.3
5	587.5	624.2	660.9	697.6	734.4	771 1	807.8	844·5	881.2
5¼	647.7	688.2	728 7	769 1	809.6	850.1	890.6	931.1	971.6
5½	710 8	755.3	799.7	844 1	888.6	933·	977.4	1021.9	1066.3
5¾	776 9	825.5	874.1	922.6	971.2	1019.8	1068.3	1116.9	1165.4
6	846.	898.9	951.7	1004 6	1057 5	1110 4	1163.2	1216.1	1269.
6¼	918.	975.3	1032.7	1090.1	1147 5	1204.8	1262.2	1319.5	1377.
6½	992.9	1054.9	1117.	1179.	1241.1	1303.1	1365.2	1427.3	1489.3
6¾	1070.7	1137.6	1204.5	1271 5	1338.4	1405.3	1472.2	1539.2	1606.1
7	1151.5	1223.5	1295.4	1367.4	1439.4	1511.3	1583.3	1655 3	1727.3
7¼	1235.2	1312.4	1389.6	1466.8	1544.0	1621.2	1698.4	1775.6	1852.8
7½	1321.9	1404 5	1487.1	1569.7	1652.4	1735.	1817 6	1900.2	1982.8
7¾	1411.5	1499.7	1587.9	1676.1	1764.3	1852 6	1940.8	2029.	2117.2
8	1504.	1598.	1692.	1786.	1880.	1974.	2068.	2162.	2256.0
8¼	1599 5	1699.4	1799.4	1899.4	1999.4	2099.3	2199.3	2299 3	2399.2
8½	1697.9	1804.	1910 1	2016.2	2122.4	2228.5	2334.6	2440.7	2546.8
8¾	1799.2	1911.7	2024 1	2136.6	2249 1	2361 5	2474.	2586.4	2698.9
9	1903.5	2022.5	2141.5	2260 4	2379.4	2498.4	2617.4	2736.3	2855.3
9¼	2010.7	2136.4	2262.1	2387.8	2513.4	2639.1	2764 8	2890 5	3016.1
9½	2120.9	2253 5	2386.	2518.6	2651.1	2783.7	2916.3	3048 8	3181.4
9¾	2234.	2373.6	2513.3	2652.9	2792.5	2932.1	3071.8	3211.4	3351.0
10	2350.	2496.9	2643 8	2790.7	2937.6	3084.4	3231.3	3378.2	3525 1
10¼	2469.	2623.3	2777 6	2932.	3086.3	3240.6	3394.9	3549 2	3703.7
10½	2590.9	2752.8	2914 8	3076.7	3238.7	3400.6	3562.5	3724.5	3886.4
10¾	2715.3	2885.5	3055.2	3227.9	3394.7	3564.5	3734.2	3903.9	4073.7
11	2843 5	3021.3	3199.	3376.7	3554.4	3732 2	3909.9	4087.6	4265.3
12	3384.1	3595.6	3807.1	4018.6	4230.1	4441.6	4653.1	4864.6	5076.1
13	3971.6	4219.8	4468.0	4716 3	4964.4	5212.7	5460.9	5709.2	5957.4
14	4606 1	4894.0	5181.9	5469.8	5757.6	6045.5	6333.4	6621.3	6909.2
15	5287.6	5618.1	5948.6	6279.1	6609.6	6940.	7270.5	7601.	7931.5
16	6016.2	6392.2	6768.2	7144.2	7520.2	7896.2	8272.2	8648.2	9024.3
17	6791 7	7216.2	7640.6	8065.1	8489.6	8914 1	9338.6	9763.1	10187.5
18	7614.2	8090.1	8566.	9041.9	9517 9	9993.7	10469.6	10945.4	11421.3
19	8483.7	9014.0	9544.2	10074.4	10601.7	11134.9	11665.2	12195.4	12725.6
20	9400.3	9987.8	10575.3	11162.8	11750 4	12337.6	12925.4	13512 9	14100.4

IMPORTERS' TABLES

OF

DISCOUNT AND ADVANCE ON BRITISH STERLING.

ADVANCE TABLES,

[In Dollars and Cents.]

In the Left Hand Column are the Pence and Shillings—at the Tops of the Columns the Rates of Advance,—in the Angle the amount in Dollars and Cents. Should the advance be on any number of Pounds, Shillings and Pence, multiply the advance on 1 Pound by the number of Pounds, then add to the product the advance on the Shillings and Pence.—The same rule applies to the Discount Tables.

Pence	45	47½	50	52½	55	57½	60	62½	65	67½	70	75	80	85	90	95	100
1	2¼	2¼	2½	2½	2¾	3	3	3	3	3	3	3¼	3¼	3½	3½	3½	3½
2	5½	5½	5½	5½	6	6	6	6	6	6	6½	6½	6½	7	7	7	7½
3	8	8	8½	8½	8½	9	9	9	9	9½	9½	10	10	10½	10½	11	11
4	11	11	11	11½	11½	11½	12	12	12	12½	12½	13	13	14	14	14½	15
5	13½	13½	14	14	14½	14½	15	15	15½	15½	16	16	17	17	17½	18	18½
6	16	16½	17	17	17	17½	18	18¾	19	19½	20	20¾	21	22	22		
7	19	19	19½	20	20	21	21	21	21	22	22	23	23	24	25	25	26
8	21½	22	22	23	23	23	24	24	24	25	25	26	27	27	28	29	30
9	24	24½	25	25	26	26	27	27	28	28	28	29	30	31	32	32	33
10	27	27½	28	28	29	29	30	30	31	31	32	32	33	34	35	36	37
11	29½	30	30½	31	32	32	33	33	34	34	35	36	37	38	39	40	41

Pence Table.

P.	45	47½	50	52½	55	57½	60	62½	65	67½	70	75	80	85	90	95	100
1½	4	4	4	4	4½	4½	4½	4½	4½	4½	5	5	5	5	5	5½	5½
2½	7	7	7	7	7	7½	7½	7½	7½	8	8	8	8	8½	9	9	9½
3½	9½	9½	9½	10	10	10	10½	10½	11	11	11	11½	11½	12	12	13	13
4½	12	12	12½	13	13	13	13½	13½	14	14	14	14½	15	15½	16	16	17
5½	15	15	15	15½	16	16	16½	16½	17	17	17½	18	18½	19	19	20	20½
6½	17½	18	18	18	19	19	19	20	20	20	20	21	22	23	23	23	24
7½	20	20½	21	21	22	22	22	23	23	23	24	24	25	26	26	27	28
8½	23	23	24	24	24	25	25	26	26	26	27	28	28	29	30	31	31
9½	26	26	26½	27	27	28	28	29	29	30	30	31	32	33	33	34	35
10½	28	28½	29	30	30	31	31	32	32	33	33	34	35	36	37	38	39
11½	31	31½	32	32	33	34	34	35	35	36	36	37	38	39	40	42	43

Pence & ha'pence.

S.	45	47½	50	52½	55	57½	60	62½	65	67½	70	75	80	85	90	95	100
1	·32	·33	·33	·34	·34	·35	·36	·36	·37	·37	·38	·39	·40	·41	·42	·43	·44
2	·65	·66	·67	·68	·69	·70	·71	·72	·73	·74	·76	·78	·80	·82	·84	·87	·89
3	·97	·98	1·00	1·02	1·03	1.05	1·07	1·08	1·10	1·12	1·13	1·17	1·20	1·23	1·27	1·30	1·33
4	1·29	1·31	1·33	1·36	1·38	1·40	1·42	1·44	1·47	1·49	1·51	1·56	1·60	1·64	1·69	1·73	1·78
5	1·61	1·64	1·67	1·69	1·72	1·75	1·78	1·81	1·83	1·86	1·89	1·94	2·00	2·06	2·11	2·17	2·22
6	1·93	1·97	2·00	2·03	2·07	2·10	2·13	2·17	2·20	2·23	2·27	2·33	2·40	2·47	2·53	2·60	2·67
7	2·25	2·29	2·33	2·37	2·41	2·45	2·49	2·53	2·57	2·61	2·64	2·72	2·80	2·88	2·96	3·08	3·11
8	2·58	2·62	2·67	2·71	2·76	2·80	2 84	2·89	2·93	2·98	3·02	3·11	3·20	3·29	3·38	3·47	3·56
9	2·90	2·95	3·00	3 05	3·10	3·15	3·20	3·25	3·30	3·35	3·40	3·50	3·60	3·70	3·80	3·90	4·00
10	3·22	3·28	3·33	3·39	3·44	3·50	3·56	3·61	3·67	3·72	3·78	3·89	4·00	4·11	4·22	4·33	4·44
11	3·54	3·61	3·67	3·73	3·79	3·85	3·91	3·97	4·03	4·09	4·16	4·28	4·40	4·52	4·64	4·77	4·89
12	3·87	3·93	4·00	4·07	4·13	4·20	4.27	4·33	4·40	4·47	4·53	4·67	4·80	4·93	5·07	5·20	5·33
13	4·19	4·26	4·33	4·41	4·48	4·55	4·62	4·69	4·77	4·84	4·91	5·06	5·20	5·34	5·49	5·63	5·78
14	4·51	4·59	4·67	4·74	4·82	4·90	4·98	5·06	5·13	5·21	5·29	5·44	5·60	5·76	5·91	6·07	6·22
15	4·83	4 92	5·00	5·08	5·17	5·25	5 33	5·42	5·50	5·58	5·67	5·83	6·00	6·17	6·33	6·50	6·67
16	5·16	5·24	5 33	5·42	5·51	5·60	5·69	5·78	5·87	5·96	6·04	6·22	6·40	6·58	6·76	6·93	7.11
17	5·48	5·57	5·67	5·76	5·86	5·95	6·04	6·14	6·23	6·33	6·42	6·61	6·80	6·99	7·18	7·37	7·56
18	5·80	5·90	6·00	6 10	6·20	6·30	6·40	6·50	6·60	6·70	6·80	7·00	7·20	7·40	7·60	7·80	8·00
19	6·12	6·23	6·33	6·44	6·54	6·65	6·76	6·86	6·97	7·07	7·18	7·39	7·60	7·81	8 02	8·23	8·44
£1	6·44	6·56	6·67	6·78	6·89	7·00	7·11	7·22	7·33	7·44	7 56	7·78	8·00	8·22	8·44	8·67	8·89

Shilling Table.

On the opposite Page **are TABLES exhibiting the Discount on British Sterling, from one Penny to one Pound.— In the left hand column will be found the British Sterling in *Shillings* and *Pence;* at the Tops of the Columns the Rates of Discount, and in the Angle the net amount, discount off. If the discount is in Shillings and Pence add the two together.**

DISCOUNT on British Sterling, from one PENNY to one POUND. In the left hand column is the Sterling, at the tops the Rates of Discount. In the Angle the Net Amount.

Pence Table.

Pen.	2½	5	7½	10	12½	15	17½	20	22½	25	27½	30
1	—	—	—	—	1	1	1	1	1	1	1	1
2	—	—	1	1	1	1	1	1	1	1	1	1
3	—	2	2	2	2	2	2	2	2	2	2	2
4	3	3	3	3	3	3	3	3	3	3	3	2
5	4	4	4	4	4	4	4	4	3	3	3	3
6	5	5	5	5	5	5	5	4	4	4	4	4
7	6	6	6	6	6	6	5	5	5	5	5	5
8	7	7	7	7	7	6	6	6	6	6	5	5
9	8	8	8	8	7	7	7	7	7	6	6	6
10	9	9	9	9	8	8	8	8	7	7	7	7
11	10	10	10	10	9	9	9	8	8	8	8	7

Shilling Table.

s.	2½	5	7½	10	12½	15	17½	20	22½	25	27½	30
1	·11	·11	·11	·10	·10	·10	·10	· 9	· 9	· 9	· 8	· 8
2	1·11	1·10	1·10	1· 9	1· 9	1· 8	1· 7	1· 7	1· 6	1· 6	1· 5	1· 4
3	2·11	2·10	2· 9	2· 8	2· 7	2· 6	2· 5	2· 4	2· 4	2· 3	2· 2	2· 1
4	3·10	3· 9	3· 8	3· 7	3· 6	3· 4	3· 3	3· 2	3· 1	3· 0	2·10	2· 9
5	4·10	4· 9	4· 7	4· 6	4· 4	4· 3	4· 1	4· 0	3·10	3· 9	3· 7	3· 6
6	5·10	5· 8	5· 6	5· 4	5· 3	5· 1	4·11	4· 9	4· 7	4· 6	4· 4	4· 2
7	6 10	6· 7	6· 5	6· 3	6· 1	5·11	5· 9	5· 7	5· 5	5· 3	5· 1	4·10
8	7· 9	7· 7	7· 4	7· 2	7· 0	6· 9	6· 7	6· 4	6· 2	6· 0	5· 9	5· 7
9	8· 9	8· 6	8· 4	8· 1	7·10	7· 7	7· 5	7· 2	6·11	6· 9	6· 6	6· 3
10	9· 9	9· 6	9· 3	9· 0	8· 9	8· 6	8· 3	8· 0	7· 9	7· 6	7· 3	7· 0
11	10· 8	10· 5	10· 2	9·10	9· 7	9· 4	9· 1	8· 9	8· 6	8· 3	7·11	7· 8
12	11· 8	11· 4	11· 1	10· 9	10· 6	10· 2	9·10	9· 7	9· 3	9· 0	8· 8	8· 4
13	12· 8	12· 4	12· 0	11· 8	11· 4	11· 0	10· 8	10· 4	10·01	9· 9	9· 5	9· 1
14	13· 7	13· 3	12·11	12· 7	12· 3	11·10	11· 6	11· 2	10·10	10· 6	10· 1	9· 9
15	14· 7	14· 3	13·10	13· 6	13· 1	12· 9	12· 4	12· 0	11· 7	11· 3	10·10	10· 6
16	15· 7	15· 2	14· 9	14· 4	14· 0	13· 7	13· 2	12· 9	12· 4	12· 0	11· 7	11· 2
17	16· 07	16· 1	15· 8	15· 3	14·10	14· 5	14· 0	13· 7	13· 2	12· 9	12· 4	11·10
18	17· 6	17· 1	16· 7	16· 2	15· 9	15· 3	14·10	14· 4	13·11	13· 6	13· 0	12· 7
19	18· 6	18· 0	17· 7	17· 1	16· 7	16· 1	15· 8	15· 2	14· 8	14· 3	13· 9	13· 3
£ 1	19· 5	19· 0	18· 6	18· 0	17· 6	17· 0	16· 6	16· 0	15· 6	15· 0	14· 6	14 0

Pence Table.

Pen.	32½	35	37½	40	42½	45	50	55	60	65	70	75
1	0	0	0	0	0	0	0	0	0	0	0	0
2	1	1	1	1	1	1	1	1	0	0	0	0
3	2	2	1	1	1	1	1	1	1	1	1	0
4	2	2	2	2	2	2	2	2	1	1	1	0
5	3	3	3	3	2	2	2	2	2	1	1	1
6	4	4	3	3	3	3	3	2	2	2	1	1
7	4	4	4	4	4	3	3	3	2	2	2	1
8	5	5	5	4	4	4	4	3	3	2	2	2
9	6	5	5	5	5	5	4	4	3	3	2	2
10	6	6	6	6	5	5	5	5	4	3	3	2
11	7	7	6	6	6	6	5	5	4	3	3	2

Shilling Table.

s.	32½	35	37½	40	42½	45	50	55	60	65	70	75
1	· 8	· 7	· 7	· 7	· 7	· 6	· 6	· 5	· 4	· 4	· 3	· 3
2	1· 4	1· 3	1· 3	1· 2	1· 1	1· 1	1· 0	·10	· 9	· 8	· 7	· 6
3	2· 0	1·11	1·10	1· 9	1· 8	1· 7	1· 6	1· 4	1· 2	1· 0	·10	· 9
4	2· 8	2· 7	2· 6	2· 4	2· 3	2· 2	2· 0	1· 9	1· 7	1· 4	1· 2	1· 0
5	3· 4	3· 3	3· 1	3· 0	2·10	2· 9	2· 6	2· 3	2· 0	1· 9	1· 6	1· 3
6	4· 0	3·10	3· 9	3· 7	3· 5	3· 3	3· 0	2· 8	2· 4	2 1	1· 9	1· 6
7	4· 8	4· 6	4· 4	4· 2	4· 0	3·10	3· 6	3· 1	2· 9	2· 5	2· 1	1· 9
8	5 4	5· 2	5· 0	4· 9	4· 7	4· 4	4· 0	3· 7	3· 2	2· 9	2· 4	2· 0
9	6· 1	5·10	5· 7	5· 4	5· 2	4·11	4· 6	4· 0	3· 7	3· 1	2· 8	2· 3
10	6· 9	6· 6	6· 3	6· 0	5· 9	5· 6	5· 0	4· 6	4· 0	3· 6	3· 0	2· 6
11	7· 5	7· 1	6·10	6· 7	6· 4	6· 0	5· 6	4·11	4· 4	3·10	3· 3	2· 9
12	8· 1	7· 9	7· 6	7· 2	6·10	6· 7	6· 0	5· 4	4· 9	4· 2	3· 7	3· 0
13	8 9	8 5	8 1	7· 9	7· 5	7· 1	6· 6	5·10	5· 2	4· 6	3·10	3· 3
14	9· 5	9· 1	8· 9	8· 4	8· 0	7· 8	7 0	6· 3	5· 7	4·10	4· 2	3· 6
15	10· 1	9· 9	9· 4	9· 0	8· 7	8· 3	7· 6	6· 9	6· 0	5 3	4· 6	3· 9
16	10· 9	10· 4	10· 0	9· 7	9· 2	8· 9	8· 0	7· 2	6· 4	5· 7	4· 9	4· 0
17	11· 5	11· 0	10· 7	10· 2	9· 9	9· 4	8· 6	7· 7	6· 9	5·11	5· 1	4· 3
18	12· 1	11· 8	11· 3	10· 9	10· 4	9·10	9· 0	8· 1	7· 2	6· 3	5· 4	4· 6
19	12·10	12· 4	11·10	11· 4	10· 11	10· 5	9· 6	8· 6	7· 7	6· 7	5· 8	4· 9
£ 1	13· 6	13· 0	12· 6	12· 0	11· 6	11· 0	10· 0	9· 0	8· 0	7· 0	6· 0	5· 0

VALUE OF STERLING IN DOLLARS AND DECIMALS

Showing the Value of £1 Sterling, in Dollars and Decimals of a Dollar, for every ¼ per cent. from par to 20 per cent. either above or below.—To find the amount of any sterling sum, at any rate per cent. included in the Table, multiply the value of £1 at the required rate, by the number of pounds sterling, and take parts for the shillings and pence.—For an eighth per cent above or below any of the rates in the Table, add or subtract .0005, and the sum or remainder will be the value required.

Rate per ct.	Above Par.	Below Par.	Rate per ct.	Above Par.	Below Par.	Rate per ct.	Above Par.	Below Par.
Par	4.4444	4.4444	7	4.7555	4.1333	14	5.0666	3.8222
¼	4.4555	4.4333	¼	4.7666	4.1222	¼	5.0777	3.8111
½	4.4666	4.4222	½	4.7777	4.1111	½	5.0888	3.8000
¾	4.4777	4.4111	¾	4.7888	4.1000	¾	5.1000	3.7888
1	4.4888	4.4000	8	4.8000	4.0888	15	5.1111	3.7777
¼	4.5000	4.3888	¼	4.8111	4.0777	¼	5.1222	3.7666
½	4.5111	4.3777	½	4.8222	4.0666	½	5.1333	3.7555
¾	4.5222	4.3666	¾	4.8333	4.0555	¾	5.1444	3.7444
2	4.5333	4.3555	9	4.8444	4.0444	16	5.1555	3.7333
¼	4.5444	4.3444	¼	4.8555	4.0333	¼	5.1666	3.7222
½	4.5555	4.3333	½	4.8666	4.0222	½	5.1777	3.7111
¾	4.5666	4.3222	¾	4.8777	4.0111	¾	5.1888	3.7000
3	4.5777	4.3111	10	4.8888	4.0000	17	5.2000	3.6888
¼	4.5888	4.3000	¼	4.9000	3.9888	¼	5.2111	3.6777
½	4.6000	4.2883	½	4.9111	3.9777	½	5.2222	3.6666
¾	4.6111	4.2777	¾	4.9222	3.9666	¾	5.2333	3 6555
4	4.6222	4.2666	11	4.9333	3.9555	18	5.2444	3.6444
¼	4.6333	4.2555	¼	4.9444	3.9444	¼	5.2555	3.6333
½	4.6444	4.2444	½	4.9555	3.9333	½	5.2666	3.6222
¾	4.6555	4.2333	¾	4.9666	3.9222	¾	5.2777	3.6111
5	4.6666	4.2222	12	4.9777	3.9111	19	5.2888	3.6000
¼	4.6777	4.2111	¼	4.9888	3.9000	¼	5.3000	3.5888
½	4.6888	4.2000	½	5.0000	3.8888	½	5.3111	3.5777
¾	4.7000	4.1888	¾	5.0111	3.8777	¾	5.3222	3.5666
6	4.7111	4.1777	13	5.0222	3.8666	20	5.3333	3.5555
¼	4.7222	4.1666	¼	5.0333	3.8555	¼	5.3444	3.5444
½	4.7333	4.1555	½	5.0444	3.8444	½	5.3555	3.5333
¾	4.7444	4.1444	¾	5.0555	3.8333	¾	5.3666	3.5222

ENGLISH (STERLING) INTEREST TABLE.

To calculate interest at 5 per cent., multiply the principal by the number of days, and divide the product by 7300.

Example.—Required the interest on £1520, 16s. 8d. for 8 days at 5 per cent.

1520 16 8
8

73,00) 121,66 13 4 (1 13 4

NOTE.—The Table of Interest at 5 per cent. may be used to find the interest at other rates, viz :—If the Interest is 2½ per cent. take one-half of the *product* of 5 per cent.; if 3, add one-tenth to one-half of 5 per cent.; if 4, deduct one-fifth from 5 per cent.; if 4½, deduct one-tenth from 5 per cent.; if 6, add one-fifth to 5 per cent.; if 7½, add one-half to 5 per cent.; if 10, double 5 per cent.

GOLD COINS WITH THEIR WEIGHT AND VALUE.

[24 grains equal 1 pennyweight, 20 pennyweights 1 ounce, 12 ounces 1 pound.

Denomination.	Weight.	Val.
UNITED STATES.	gr.	$. c.
Eagle before 1834, ... ($\frac{1}{2}$ & $\frac{1}{4}$ in proportion.)	270	10 66
Eagles, after 1834, ...	258	10 00
Double Eagle, ...	516	20 00
Half Eagle, ...	129	5 00
Three Dollar piece,.....	77.4	3 00
Quarter Eagle, ...	64.5	2 50
Gold Dollar,.....	25.8	1 00
AUSTRIA.	dt. gr.	$ c.
Quadruple Ducat, ...	9 00	9 12
Ducat,.....	2 $5\frac{3}{4}$	2 28
Souverain (for Lombardy)	7 7	6 75
BAVARIA.		
Carolin,.....	6 $5\frac{1}{2}$	4 93
Ducat,.....	2 $5\frac{3}{4}$	2 27
BELGIUM.		
Twenty Franc pieces, ..	4 $3\frac{1}{2}$	3 82
Forty Franc pieces,.....	8 7	7 67
BOLIVIA.		
Doubloon,.....	17 $8\frac{1}{2}$	15 58
BRAZIL.		
Johannes, ($\frac{1}{2}$ in prop.)...	18 00	17 4
Dobroan,.....	34 12	32 71
Dobra,.....	18 16	17 31
Moidore, ($\frac{1}{2}$ in prop.)...	6 22	6 56
Piece of 6,400 reis,.....	9 6	8 72
BRUNSWICK & MECKLENBURGH.		
Ten Thaler, 1813 to 1838,	8 13	7 89
CENTRAL AMERICA.		
Doubloon,.....	17 9	14 96
COLUMBIA.		
Doubloon,.....	17 $8\frac{1}{2}$	15 62
CHILI.		
Doubloon, (before 1835.)	17 9	15 57
" (after 1835,)..	17 9	15 66
DENMARK.		
Ten Thaler,.....	8 13	7 88
Fred. D'or, 1813 to 1839,	4 6	3 93
ENGLAND.		
Guinea, ($\frac{1}{3}$ in prop.).....	5 8	5 05
Sovereigns, ($\frac{1}{4}$ in prop.) .	5 $3\frac{1}{2}$	4 85
" (Double)	10 $6\frac{1}{2}$	9 70
EAST INDIES.		
Rupee, Bombay,.....	7 11	7 09
Rupee, Madras, ...	7 12	7 11
Pagoda, Star,.....	2 $4\frac{1}{2}$	1 79
SAXONY.		
Double Aug. D'or, 1837, .	8 13	7 94
Ducat,.....	2 6	2 26

Denomination.	Weight.	Val.
FRANCE.	dt. gr.	$. c.
D'ble Louis, (before 1786)	10 11	9 71
Louis, do	5 4	4 79
D'ble Louis, (since 1786).	9 20	9 16
Louis, do	4 22	4 52
Double Napoleon, or 40 Francs,.....	8 7	7 68
Napoleon, or 20 Francs, .	4 $3\frac{1}{2}$	3 84
HOLLAND.		
Double Ryder,.....	12 21	12 20
Ryder,.....	6 9	6 04
Ducat,.....	2 $5\frac{3}{4}$	2 27
HAMBURGH.		
Ducat, (double in prop.) .	2 $5\frac{3}{4}$	2 27
HANOVER.		
Ten Thaler, George II. .	8 13	7 84
Do. Wm. IV. & Ernest, .	8 13	7 89
Fine Thaler.....	4 6	3 91
Ducat,.....	2 $5\frac{1}{2}$	2 28
HINDUSTAN.		
Mohur, E. I. Co.....	7 12	7 10
NETHERLANDS.		
Ducat,.....	2 $5\frac{3}{4}$	2 27
Ten Gilders, ($\frac{1}{4}$ in prop.) .	4 $7\frac{1}{4}$	4 00
NEW GRENADA.		
Doubloon, (of various fineness) from $15,31 to $15,-71, generally weigh the same as a dollar, average	17 $8\frac{1}{2}$	15 53
MEXICO.		
Doubloon, (shares in prop.) various dates coined at different mints, varying in value from $15 44 to $15 67,....average,....	17 $8\frac{1}{2}$	15 53
PRUSSIA.		
Frederick D'or,.....	4 6	3 95
Double do, 1831,.....	8 13	7 97
Do. do. to 1811.....	8 13	7 92
RUSSIA.		
Five Rubles,.....	4 4	3 95
Ducat, 1796.....	2 18	2 76
Imperial, 1801, ($\frac{1}{2}$ in prop.)	8 7	7 84
SARDINIA.		
Twenty Lire,.....	4 3	3 83
SWEDEN.		
Ducat,.....	2 5	2 23
SPAIN.		
Quadruple Pistole, or Doubloon, ($\frac{1}{8}$ in prop.) 1772,..	17 $8\frac{1}{2}$	16 03
Doubloon, 1801,.....	17 9	15 54
Pistole ($\frac{1}{4}$ Doubloon).....	4 $8\frac{1}{4}$	3 90

RATES OF SILVER MONEY AND FOREIGN CURRENCY.

(Established by Law.—Custom House Value.)

	$ c. m.		$ c. m.
Dollar of U. S. (½ & ¼ in prop.)	1.00	Double Thaler of Prussia,	1.39
of Austria,	97	Real Vellon of Spain,	5
of Sweden, (species daler,)	1.04	of Plate,	10
of Norway, (Rigsbank daler)	1 05	Pistareen (4 Real Vellons of Spain,)	19 5
of Netherlands,	1.00	Pound of British Provinces,	4.00
of Denmark, (Species daler,)	1.04	of Jamaica, Turks Island, and Honduras,	3.00
of Bremen,	78 7	of Nassau,	2.50
of Bolivia, Peru & Chili,	1.00 6	Ducat of Naples,	80
of Central Am. uncertain,	97	Ounce of Sicily,	2.40
of Mexico, 8 reals, (varying from 95 to 100,)	1.00	Scudo of Malta,	40
of New Grenada, (usual wt.)	1.02	of Naples,	94
Pound Sterling of Gr. Britain,	4.84	of Rome,	1.00 5
Half Crown of do.	54	Pezzo of Leghorn,	90 7
Shilling of do.	22	Mill Rea of Azores,	83 3
Fourpence of do.	7	of Madeira,	1.00
Franc of France and Belgium,	18 5	of Portugal,	1.12
Five Franc of France,	93	Marc Banco of Hamburg,	35
Rix Dollar of Austria,	97	Rouble of Russia, silver,	75
of Berlin & Saxony,	69	of Russia, paper,	21 4
of Batavia,	75	Piastre of Turkey,	5
Thaler of Prussia, Saxony, Brunswick, & Hesse Cassel,	68	Twenty Piastres of Turkey,	82
of Leipsic and Hanover,	69	Lira, (for Lombardy & Tuscany,)	16
Florins and Guilders of Nuremburg, St. Gall, Frankfort, Netherlands, Bavaria, Brazil, Baden, Amsterdam, and Rotterdam,	40	Twenty Kreutzers,	16
of Austria, Trieste, Bohemia Liepsic, and Augsburg,	48 5	Lira of Sardinia,	18 5
of Prussia,	23	Five Lira of Sardinia,	93 2
of Tuscany,	26	Livre of Genoa,	18 5
of Brabant,	34	of Catalonia & Barcelona,	53 5
Guilder of Wurtemberg,	39 5	of Neufchatel,	26 5
		Tale of China,	1.48
		Pagoda of Madras,	1.84
		Crown of Tuscany,	1.05
		Pagoda of India	1.84
		Rupee of British India,	44 5

All foreign Silver Coins possess a higher standard value than the present United States coinage.

VALUE AND WEIGHT OF U. STATES SILVER COINS.

Names of the Coins.	*Grains.*	*Value.*
One Dollar, or ten Dimes, (No change in Law.)		100
Half Dollar, or five Dimes,	192.	50
Quarter Dollar, or two and a half Dimes,	96.	25
One Dime,	38.4	10
Half Dime,	19.2	5
Three Cent piece,	11.52	3
Copper Cent,	168.	1
Half Cent,	84.	0.5

The Standard fineness of Gold and Silver Coins is *one weight of alloy to nine weights of pure metal.* The alloy for Gold Coin is Silver and Copper, and Copper for Silver Coin. On the following page will be found the weight of the American and Spanish Dollar and Parts,—of the old coinage.

REDUCTION OF FOREIGN MONEY.

A U. States Silver Dollar weighs 412½ grains; Half Dollar 206¼; Quarter Dollar 103; Dime 41; Half Dime 20. Spanish Dollar, of late coinage, 416 grains; Half Dollar 208; Quarter Dollar (1774) 103½; One-Eighth, or, Real, 45; One-Sixteenth, or, 6¼ Cent piece, 21.

ENGLISH STERLING REDUCED TO DOLLARS AND CENTS.

s.	$ c. m.	s.	$ c. m.	£	$ c.	£	$ c.	£	$ c.	£	$ c.	£	$ c.
1	24 2	11	2 66 2	1	4 84	11	53 24	21	101 64	31	150 04	41	198 44
2	48 4	12	2 90 4	2	9 68	12	58 08	22	106 48	32	154 88	42	203 28
3	72 6	13	3 14 6	3	14 52	13	62 92	23	111 32	33	159 72	43	208 12
4	96 8	14	3 38 8	4	19 36	14	67 76	24	116 16	34	164 56	44	212 96
5	1 21 0	15	3 63 0	5	24 20	15	72 60	25	121 00	35	169 40	45	217 80
6	1 45 2	16	3 87 2	6	29 04	16	77 44	26	125 84	36	174 24	46	222 64
7	1 69 4	17	4 11 4	7	33 88	17	82 28	27	130 68	37	179 08	47	227 48
8	1 93 6	18	4 35 6	8	38 72	18	87 12	28	135 52	38	183 92	48	232 32
9	2 17 8	19	4 59 8	9	43 56	19	91 96	29	140 36	39	188 76	49	237 16
10	2 42 0	20	4 84 0	10	48 40	20	96 80	30	145 20	40	193 60	50	242 00

FRENCH FRANCS REDUCED TO DOLLARS AND CENTS.

fr	$ cts	fr	$ cts	fr	$ cts	fr	$ cts	fr	$ cts	fr	$ cts	frs	$ cts
1	19	16	2 98	31	5 77	46	8 56	61	11 35	76	14 14	91	16 93
2	37	17	3 16	32	5 95	47	8 74	62	11 53	77	14 32	92	17 11
3	56	18	3 35	33	6 14	48	8 93	63	11 72	78	14 51	93	17 30
4	74	19	3 53	34	6 32	49	9 11	64	11 90	79	14 69	94	17 48
5	93	20	3 72	35	6 51	50	9 30	65	12 09	80	14 88	95	17 67
6	1 12	21	3 91	36	6 70	51	9 49	66	12 28	81	15 07	96	17 86
7	1 30	22	4 09	37	6 88	52	9 67	67	12 46	82	15 25	97	18 04
8	1 49	23	4 28	38	7 07	53	9 86	68	12 65	83	15 44	98	18 23
9	1 67	24	4 46	39	7 25	54	10 04	69	12 83	84	15 62	99	18 41
10	1 86	25	4 65	40	7 44	55	10 23	70	13 02	85	15 81	100	18 60
11	2 05	26	4 84	41	7 63	56	10 42	71	13 21	86	16 00	200	37 20
12	2 23	27	5 02	42	7 81	57	10 60	72	13 39	87	16 18	300	55 80
13	2 42	28	5 21	43	8 00	58	10 79	73	13 58	88	16 37	400	74 40
14	2 60	29	5 39	44	8 18	59	10 97	74	13 76	89	16 55	500	93 00
15	2 79	30	5 58	45	8 37	60	11 16	75	13 95	90	16 74	600	111 60

THALERS REDUCED TO DOLLARS AND CENTS.

T	$ c.	T	$ c.	T	$ c.	T	$ c.	T	$ c.	T	$ c.	T	$ c.
1	69	8	5 52	15	10 35	22	15 18	29	20 1	36	24 84	43	29 67
2	1 38	9	6 21	16	11 4	23	15 87	30	20 70	37	25 53	44	30 36
3	2 07	10	6 90	17	11 73	24	16 56	31	21 39	38	26 22	45	31 5
4	2 76	11	7 59	18	12 42	25	17 25	32	22 8	39	26 91	46	31 74
5	3 45	12	8 28	19	13 11	26	17 94	33	22 77	40	27 60	47	32 43
6	4 14	13	8 97	20	13 80	27	18 63	34	23 46	41	28 29	48	33 12
7	4 83	14	9 66	21	14 49	28	19 32	35	24 15	42	28 98	49	33 81

BREMEN RIX DOLLARS REDUCED TO DOLLARS AND CENTS.

r. d.	$ c.	r. d.	$ c.	r. d.	$ c.	r. d.	$ c.	r. d.	$ c.	r. d.	$ c.	r. d.	$ c.
1	78¾	9	7 09	17	13 39	25	19 69	33	25 99	41	32 29		
2	1 58	10	7 88	18	14 18	26	20 48	34	26 78	42	33 08		
3	2 36	11	8 66	19	14 96	27	21 26	25	27 56	43	33 86		
4	3 15	12	9 45	20	15 75	28	22 05	36	28 35	44	34 65		
5	3 94	13	10 24	21	16 54	29	22 84	37	29 14	45	35 44		
6	4 73	14	11 03	22	17 33	30	23 63	38	29 93	46	36 23		
7	5 51	15	11 81	23	18 11	31	24 41	39	30 71	47	37 01		
8	6 30	16	12 60	24	18 90	32	25 20	40	31 50	48	37 80		

BANK INTEREST TABLE — FOR 365 DAYS — AT 6 PER CENT. PER ANNUM.

[Fom One Dollar to One Thousand Dollars, and from One Day to Thirty Days, and to Three Months.—Carefully compared with the best Tables.]

☞ Days.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	1 m	2 m	3 m
☞ Dolls.	c.	c.	c.	c.	c.	c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.
$ 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	3
3	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	4
4	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	4	6
5	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	5	7
6	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	6	9
7	0	0	0	0	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	7	10
8	0	0	0	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	4	4	4	4	4	8	12
9	0	0	0	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	3	3	4	4	4	4	4	4	4	4	9	13
10	0	0	0	1	1	1	1	1	1	2	2	2	2	2	2	3	3	3	3	3	3	4	4	4	4	4	4	5	5	5	5	10	15
20	0	1	1	1	2	2	2	3	3	3	4	4	4	5	5	5	6	6	6	7	7	7	8	8	8	9	9	9	10	10	10	20	30
30	0	1	2	2	2	3	3	4	4	5	5	6	6	7	7	8	8	9	9	10	10	11	11	12	12	13	13	14	14	15	15	30	45
40	1	1	2	3	3	4	5	5	6	7	7	8	9	9	10	11	11	12	12	13	14	14	15	16	16	17	18	18	19	20	20	40	60
50	1	2	2	3	4	5	6	7	7	8	9	10	11	12	12	13	14	15	16	16	17	18	19	20	21	21	22	23	24	25	25	50	75
60	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	30	60	90
70	1	2	3	5	6	7	8	9	10	12	13	14	15	16	17	18	20	21	22	23	24	25	26	28	29	30	31	32	33	35	35	70	1.05
80	1	3	4	5	7	8	9	11	12	13	14	16	17	18	20	21	22	24	25	26	28	29	30	32	33	34	36	37	38	39	40	80	1.20
90	1	3	4	6	7	9	10	12	13	15	16	18	19	21	22	24	25	27	28	30	31	33	34	36	37	38	40	41	43	44	45	90	1.35
100	2	3	5	7	8	10	12	13	15	16	18	20	21	23	25	26	28	30	31	33	35	36	38	39	41	43	44	46	48	49	50	1.00	1.50
200	3	7	10	13	16	20	23	26	30	33	36	39	43	46	49	53	56	59	62	66	69	72	76	79	82	85	89	92	95	99	1.00	2.00	3.00
300	5	10	15	20	25	30	35	39	44	49	54	59	64	69	74	79	84	89	94	99	1.04	1.08	1.13	1.18	1.23	1.28	1.33	1.38	1.43	1.48	1.50	3.00	4.50
400	7	13	20	26	33	40	46	53	59	66	72	79	85	92	99	1.05	1.12	1.18	1.25	1.32	1.38	1.45	1.51	1.58	1.64	1.71	1.78	1.84	1.91	1.97	2.00	4.00	6.00
500	8	16	25	33	41	49	58	66	74	82	90	99	1.07	1.15	1.23	1.32	1.40	1.48	1.56	1.64	1.73	1.81	1.89	1.97	2.05	2.14	2.22	2.30	2.38	2.47	2.50	5.00	7.50
$ 1000	16	33	49	66	82	99	1.15	1.32	1.48	1.64	1.81	1.97	2.14	2.30	2.47	2.63	2.79	2.96	3.12	3.29	3.45	3.62	3.78	3.95	4.11	4.27	4.44	4.60	4.77	4.93	5.00	10.00	15.00

First Example at 6 per cent.

Required 37 days interest on $ 90 dollars.

Interest on $ 90. for 30 days, 44 cents.
Interest on $ 90 for 7 days, 10 cents.

Answer 54 cents.

Second Example at 6 per cent.

Required 1 month and 3 days' interest on 104 dollars.

Interest on $ 100 for 1 month is 50 cents.
Interest on $ 4 for 1 month is 2 cents.
Interest on $ 100 for 3 days is 5 cents.
Interest on $ 4 for 3 days is 0 cents.

Answer, 57 cents.

Method of calculating Interest at 6 per ct.

Multiply the Sum by the number of Days, divide the Product by 6, then strike off the right hand figure.

Example:— 200 dollars
multiplied by 11 days.

Divide by 6) 2200 (36 [0] cents is the interest.

NEW YORK BANK INTEREST TABLE—FOR 365 DAYS—AT 7 PER CENT. PER ANNUM.

[From One Dollar to One Thousand, and from One Day to Thirty Days, and to Three Months.—Carefully compared with the best Tables.]

Days.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	1 m	2 m	3 m
Dolls.	c.	c.	c.	c.	c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$.	$ c.	$ c.	$ c.	$ c.	$ c.	$. c.
$ 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	2
2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	4
3	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	3	5
4	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	5	7
5	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	6	9
6	0	0	0	0	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	7	11
7	0	0	0	1	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	3	3	4	4	4	4	4	4	4	8	12
8	0	0	0	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	3	4	4	4	4	4	4	4	5	5	9	14
9	0	0	0	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	4	5	5	5	5	5	10	16
10	0	0	1	1	1	1	2	2	2	2	2	2	3	3	3	3	4	4	4	4	4	4	5	5	5	5	5	6	6	6	6	12	18
20	0	1	1	2	2	2	3	3	3	4	4	5	5	5	6	6	7	7	7	8	8	8	9	9	10	10	10	11	11	12	12	23	35
30	0	1	2	2	3	3	4	5	5	6	6	7	7	8	9	9	10	10	11	12	12	13	13	14	14	15	16	16	17	17	17	35	53
40	1	2	2	3	4	5	5	6	7	8	8	9	10	11	12	12	13	14	15	15	16	17	18	18	19	20	21	21	22	23	23	47	70
50	1	2	3	4	5	6	7	8	9	10	11	12	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	29	58	86
60	1	2	3	5	6	7	8	9	10	12	13	14	15	16	17	18	20	21	22	23	24	25	26	28	29	30	31	32	33	35	35	70	1.05
70	1	3	4	5	7	8	9	11	12	13	15	16	17	19	20	21	23	24	26	27	28	30	31	32	34	35	36	38	39	40	41	82	1.23
80	2	3	5	6	8	9	11	12	14	15	17	18	20	21	23	25	26	28	29	31	32	34	35	37	38	40	41	43	44	46	47	93	1.40
90	2	3	5	7	9	10	12	14	16	17	19	21	22	24	26	28	29	31	33	35	36	38	40	41	43	45	47	48	50	52	52	1.05	1.58
100	2	4	6	8	10	12	13	15	17	19	21	23	25	27	29	31	33	35	36	38	40	42	44	46	48	50	52	54	56	58	58	1.17	1.75
200	4	8	12	15	19	23	27	31	35	38	42	46	50	54	58	61	65	69	73	77	81	84	88	92	96	1.00	1.04	1.07	1.11	1.15	1.17	2.33	3.50
300	6	12	17	23	29	35	40	46	51	58	63	69	75	81	86	92	98	1.04	1.09	1.15	1.21	1.27	1.32	1.38	1.44	1.50	1.55	1.61	1.67	1.73	1.75	3.50	5.25
400	8	15	23	31	38	46	54	61	69	77	84	92	1.00	1.07	1.15	1.23	1.30	1.38	1.46	1.53	1.61	1.69	1.76	1.84	1.92	2.00	2.07	2.15	2.22	2.30	2.33	4.67	7.00
500	10	19	29	38	48	58	67	77	86	96	1.05	1.15	1.25	1.34	1.44	1.53	1.63	1.73	1.82	1.92	2.01	2.11	2.21	2.30	2.40	2.50	2.59	2.68	2 78	2.88	2.92	5 83	8.75
$ 1000	19	38	58	77	96	1.15	1.34	1.53	1.73	1.92	2.11	2.30	2.49	2.68	2.88	3.07	3.26	3.45	3.64	3 84	4.03	4.22	4.41	4.60	4.79	4.99	5 18	5.37	5.56	5.75	5 83	11.67	17.50

First Example at 7 per cent.

Required 2 months and 8 days interest on $ 95.

Interest on $ 90 for 2 mo. is	$ 1.05
Interest on $ 5 for 2 mo. is	6
Interest on $ 90 for 8 days is	14
Interest on $ 5 for 5 days is	0
Answer,	$ 1.25

Second Example at 7 per cent.

Required 19 days interest on 170 dollars.

Interest on $ 100 for 19 days,	36 cents.
Interest on $ 70 for 19 days,	26 cents.
Answer,	62 cents.

When 7 per cent interest is required add to the interest of 6 per cent its one-sixth—as follows:—

Suppose the interest 36 cts, as in example on page 107.

One-sixth of 36 is 6, which added to 36 makes 42, the interest of $ 200 for 11 days at 7 per cent.; and so if 8 per cent is required, add one-third; and if 5 per cent is required, deduct one-sixth from 6 per cent.

BANK INTEREST TABLE — FOR 365 DAYS — AT 6 PER CENT. PER ANNUM.

[From One Dollar to One Thousand Dollars, and from One Day to Thirty Days, and to Three Months.—Carefully compared with the best Tables.]

Days.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	1 m	2 m	3 m
Dolls.	c.	c.	c.	c.	c.	c.	$.c.	$ c.	$.c.	$.c.	$.c.	$.c.	$.c.	$.c.	$.c.	$.c.	$.c.	$.c.	$.c.	$ c.	$.c.	$.c.	$.c.	$.c.	$.c.	$.c.	$ c.	$ c.	$.c.	$ c.	$.c.	$. c.	$.c.
$ 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	3
3	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	4
4	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	4	6
5	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	5	7
6	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	6	9
7	0	0	0	0	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	7	10
8	0	0	0	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	4	4	4	4	4	8	12
9	0	0	0	1	1	1	1	1	1	1	2	2	2	2	2	2	3	3	3	3	3	3	3	4	4	4	4	4	4	4	4	9	13
10	0	0	0	1	1	1	1	1	1	2	2	2	2	2	2	3	3	3	3	3	3	4	4	4	4	4	4	5	5	5	5	10	15
20	0	1	1	1	2	2	2	3	3	3	4	4	4	5	5	5	6	6	6	7	7	7	8	8	8	9	9	9	10	10	10	20	30
30	0	1	2	2	2	3	3	4	4	5	5	6	6	7	7	8	8	9	9	10	10	11	11	12	12	13	13	14	14	15	15	30	45
40	1	1	2	3	3	4	5	5	6	7	7	8	9	9	10	11	11	12	12	13	14	14	15	16	16	17	18	18	19	20	20	40	60
50	1	2	2	3	4	5	6	7	7	8	9	10	11	12	12	13	14	15	16	16	17	18	19	20	21	21	22	23	24	25	25	50	75
60	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	30	60	90
70	1	2	3	5	6	7	8	9	10	12	13	14	15	16	17	18	20	21	22	23	24	25	26	28	29	30	31	32	33	35	35	70	1.05
80	1	3	4	5	7	8	9	11	12	13	14	16	17	18	20	21	22	24	25	26	28	29	30	32	33	34	36	37	38	39	40	80	1.20
90	1	3	4	6	7	9	10	12	13	15	16	18	19	21	22	24	25	27	28	30	31	33	34	36	37	38	40	41	43	44	45	90	1.35
100	2	3	5	7	8	10	12	13	15	16	18	20	21	23	25	26	28	30	31	33	35	36	38	39	41	43	44	46	48	49	50	1.00	1.50
200	3	7	10	13	16	20	23	26	30	33	36	39	43	46	49	53	56	59	62	66	69	72	76	79	82	85	89	92	95	99	1.00	2.00	3.00
300	5	10	15	20	25	30	35	39	44	49	54	59	64	69	74	79	84	89	94	99	1.04	1.08	1.13	1.18	1.23	1.28	1.33	1.38	1.43	1.48	1 50	3.00	4.50
400	7	13	20	26	33	40	46	53	59	66	72	79	85	92	99	1.05	1.12	1.18	1.25	1.32	1.38	1.45	1.51	1.58	1.64	1.71	1.78	1.84	1.91	1.97	2.00	4.00	6.00
500	8	16	25	33	41	49	58	66	74	82	90	99	1.07	1.15	1.23	1.32	1.40	1.48	1.56	1.64	1.73	1.81	1.89	1.97	2.05	2.14	2.22	2 30	2 38	2.47	2.50	5 00	7.50
$ 1000	16	33	49	66	82	99	1.15	1.32	1.48	1.64	1.81	1 97	2.14	2 30	2 47	2.63	2.79	2.96	3.12	3.29	3.45	3 62	3.78	3.95	4.11	4.27	4.44	4 60	4.77	4.93	5 00	10.00	15.00

First Example at 6 per cent.

Required 37 days interest on $ 90 dollars.

Interest on $ 90. for 30 days,	44 cents.
Interest on $ 90 for 7 days,	10 cents.
Answer	54 cents.

Second Example at 6 per cent.

Required 1 month and 3 days' interest on 104 dollars.

Interest on $ 100 for 1 month is	50 cents.
Interest on $ 4 for 1 month is	2 cents.
Interest on $ 100 for 3 days is	5 cents.
Interest on $ 4 for 3 days is	0 cents.
Answer,	57 cents.

Method of calculating Interest at 6 per ct.

Multiply the Sum by the number of Days, divide the Product by 6, then strike off the right hand figure.

Example:— 200 dollars
multiplied by 11 days.

Divide by 6) 2200 (366 [0] cents is the interest.

NEW YORK BANK INTEREST TABLE—FOR 365 DAYS—AT 7 PER CENT. PER ANNUM.

[From One Dollar to One Thousand, and from One Day to Thirty Days, and to Three Months.—Carefully compared with the best Tables.]

Days.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	1 m	2 m	3 m
Dolls.	c.	c.	c.	c.	c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.
$ 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	2
2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	4
3	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	3	5
4	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	5	7
5	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	6	9
6	0	0	0	0	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	7	11
7	0	0	0	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	4	4	4	4	4	4	8	12
8	0	0	0	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	4	4	4	5	5	5	9	14
9	0	0	0	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	5	10	16
10	0	0	1	1	1	1	2	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	12	18
20	0	1	1	2	2	2	3	3	3	4	4	5	5	5	6	6	7	7	7	8	8	8	9	9	10	10	10	11	11	12	12	23	35
30	0	1	2	2	3	3	4	5	5	6	6	7	7	8	9	9	10	10	11	12	12	13	13	14	14	15	16	16	17	17	17	35	53
40	1	2	2	3	4	5	5	6	7	8	8	9	10	11	12	12	13	14	15	15	16	17	18	18	19	20	21	21	22	23	23	47	70
50	1	2	3	4	5	6	7	8	9	10	11	12	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	29	58	86
60	1	2	3	5	6	7	8	9	10	12	13	14	15	16	17	18	20	21	22	23	24	25	26	28	29	30	31	32	33	35	35	70	1.05
70	1	3	4	5	7	8	9	11	12	13	15	16	17	19	20	21	23	24	26	27	28	30	31	32	34	35	36	38	39	40	41	82	1.23
80	2	3	5	6	8	9	11	12	14	15	17	18	20	21	23	25	26	28	29	31	32	34	35	37	38	40	41	43	44	46	47	93	1.40
90	2	3	5	7	9	10	12	14	16	17	19	21	22	24	26	28	29	31	33	35	36	38	40	41	43	45	47	48	50	52	52	1.05	1.58
100	2	4	6	8	10	12	13	15	17	19	21	23	25	27	29	31	33	35	36	38	40	42	44	46	48	50	52	54	56	58	58	1.17	1.75
200	4	8	12	15	19	23	27	31	35	38	42	46	50	54	58	61	65	69	73	77	81	84	88	92	96	1.00	1.04	1.07	1.11	1.15	1.17	2.33	3.50
300	6	12	17	23	29	35	40	46	51	58	63	69	75	81	86	92	98	1.04	1.09	1.15	1.21	1.27	1.32	1.38	1.44	1.50	1.55	1.61	1.67	1.73	1.75	3.50	5.25
400	8	15	23	31	38	46	54	61	69	77	84	92	1.00	1.07	1.15	1.23	1.30	1.38	1.46	1.53	1.61	1.69	1.76	1.84	1.92	2.00	2.07	2.15	2.22	2.30	2.33	4.67	7.00
500	10	19	29	38	48	58	67	77	86	96	1.05	1.15	1.25	1.34	1.44	1.53	1.63	1.73	1.82	1.92	2.01	2.11	2.21	2.30	2.40	2.50	2.59	2.68	2 78	2.88	2.92	5 83	8.75
$ 1000	19	38	58	77	96	1.15	1.34	1.53	1.73	1.92	2.11	2.30	2.49	2.68	2.88	3.07	3.26	3.45	3.64	3 84	4.03	4.22	4.41	4.60	4.79	4.99	5 18	5.37	5.56	5.75	5 83	11.67	17.50

First Example at 7 per cent.

Required 2 months and 8 days interest on $ 95.

Interest on $ 90 for 2 mo. is $ 1.05
Interest on $ 5 for 2 mo. is 6
Interest on $ 90 for 8 days is 14
Interest on $ 5 for 5 days is 0

Answer, $ 1.25

Second Example at 7 per cent.

Required 19 days interest on 170 dollars.

Interest on $ 100 for 19 days, 36 cents.
Interest on $ 70 for 19 days, 26 cents.

Answer, 62 cents.

When 7 per cent interest is required add to the interest of 6 per cent its one-sixth—as follows:—

Suppose the interest 36 cts, as in example on page 107.

One-sixth of 36 is 6, which added to 36 makes 42, the interest of $ 200 for 11 days at 7 per cent.; and so if 8 per cent is required, add one-third; and if 5 per cent is required, deduct one-sixth from 6 per cent.

MONTH AND YEAR INTEREST TABLES

MONTH INTEREST TABLE, AT SIX PER CENT PER ANNUM.

[*See Table of Interest, by Day, at page* 106.]

Doll.	1 *Mo*	2 *Mo*	3 *Mo*	4 *Mo*	5 *Mo*	6 *Mo*	7 *Mo*	8 *Mo*	9 *Mo*	10 *M*	11 *M*	1 *Yr*
1·	·1	·1	·2	·2	·3	·3	·4	·4	·5	·5	·6	·6
2·	·1	·2	·3	·4	·5	·6	·7	·8	·9	·10	·11	·12
3·	·2	·3	·5	·6	·8	·9	·11	12	·14	·15	·17	·18
4·	·2	·4	·6	·8	·10	·12	·14	·16	·18	·20	·22	·24
5·	·3	·5	·8	·10	·13	·15	·18	·20	·23	·25	·28	·30
6·	·3	·6	·9	·12	·15	·18	·21	·24	·27	·30	·33	·36
7·	·4	·7	·11	·14	·18	·21	·25	·28	·32	·35	·39	·42
8·	·4	·8	·12	·16	·20	·24	·28	·32	·36	·40	·44	·48
9·	·5	·9	·14	·18	·23	·27	·32	·36	·41	·45	·50	·54
10·	·5	·10	·15	·20	·25	·30	·35	·40	·45	·50	·55	·60
15·	·8	·15	·23	·30	·38	·45	·53	·60	·68	·75	·83	·90
20·	·10	·20	·30	·40	·50	·60	·70	·80	·90	1·00	1·10	1·20
25·	·13	·25	·38	·50	·63	·75	·88	1·00	1·13	1·25	1·38	1·50
30·	·15	·30	·45	·60	·75	·90	1·05	1·20	1·35	1·50	1·65	1·80
40·	·20	·40	·60	·80	1·00	1·20	1·40	1·60	1·80	2·00	2 20	2·40
50·	·25	·50	·75	1·00	1·25	1·50	1·75	2·00	2·25	2·50	2·75	3·00
60·	·30	·60	·90	1·20	1·50	1·80	2·10	2·40	2·70	3·00	3·30	3·60
70·	·35	·70	1·05	1·40	1·75	2·10	2·45	2·80	3·15	3·50	3·85	4·20
80·	·40	·80	1·20	1·60	2·00	2·40	2·80	3·20	3 60	4·00	4·40	4·80
90·	·45	·90	1·35	1·80	2·25	2·70	3·15	3·60	4·05	4·50	4·95	5·40
100·	·50	1·00	1·50	2·00	2·50	3·00	3·50	4·00	4·50	5·00	5·50	6·00
200·	1·00	2·00	3·00	4·00	5·00	6·00	7·00	8·00	9·00	10·00	11·00	12·00
300·	1·50	3·00	4 50	6·00	7·50	9·00	10·50	12·00	13 50	15·00	16·50	18·00
400·	2·00	4·00	6·00	8·00	10·00	12·00	14·00	16·00	18·00	20·00	22·00	24·00
500·	2·50	5·00	7·50	10·00	12·50	15·00	17·50	20·00	22·50	25·00	27·50	30·00
1000·	5·00	10·00	15·00	20·00	25·00	30·00	35·00	40·00	45·00	50·00	55·00	60·00

MONTH INTEREST TABLE, AT SEVEN PER CENT PER ANNUM.

[*See Table of Interest, by Day, at page* 107.]

Doll.	1 *Mo*	2 *Mo*	3 *Mo*	4 *Mo*	5 *Mo*	6 *Mo*	7 *Mo*	8 *Mo*	9 *Mo*	10 *M*	11 *M*	1 *Yr*
1·	·1	·1	·2	·2	·3	·4	·4	·5	·5	·6	·6	·7
2·	·1	·2	·4	·5	·6	·7	·8	·9	·11	·12	·13	·14
3·	·2	·4	·5	·7	·9	·11	·12	·14	·16	·18	·19	·21
4·	·2	·5	·7	·9	·12	·14	·16	19	·21	·23	·26	·28
5·	·3	·6	·9	·12	·15	·18	·20	·23	·26	·29	·32	·35
6·	·4	·7	·11	·14	·18	·21	·25	·28	·32	·35	·39	·42
7·	·4	·8	·12	·16	·20	·25	·29	·33	·37	·41	·45	·49
8·	·5	·9	·14	·19	·23	·28	·33	·37	·42	·47	·51	·56
9·	·5	·11	·16	·21	·26	·32	·37	·42	·47	·53	·58	·63
10·	·6	·12	·18	·23	·29	·35	·41	·47	·53	·58	·64	·70
15·	·9	.18	·26	·35	·44	·53	·61	·70	·79	·88	·96	1.05
20·	·12	·23	·35	·47	·58	·70	·82	·93	1·05	1·17	1·28	1·40
25·	·15	·29	·44	·58	·72	·88	1·02	1·17	1·31	1·46	1·60	1·75
30·	·18	·35	·53	·70	·88	1·05	1·23	1·40	1·58	1·75	1·93	2·10
40·	·23	·47	·70	·93	1·17	1·40	1·63	1·87	2·10	2·33	2·57	2·80
50·	·29	·58	·88	1·17	1·46	1·75	2·04	2·33	2·63	2·92	3·21	3·50
60·	·35	·70	1·05	1·40	1·75	2·10	2·45	2·80	3·15	3·50	3·85	4·20
70·	·41	·82	1·23	1·63	2·04	2·45	2·86	3·27	3·68	4·08	4·49	4·90
80·	·47	·93	1·40	1·87	2·33	2·80	3·27	3·73	4·20	4·67	5·13	5·60
90·	·53	1·05	1·58	2·10	2·63	3·15	3·68	4·20	4·73	5·25	5 78	6·30
100·	·56	1·17	1·75	2·33	2·92	3·50	4·08	4·67	5·25	5·83	6·42	7·00
200·	1·17	2·33	3·50	4·67	5·83	7·00	8·17	9·33	10·50	11·67	12·83	14·00
300·	1·75	3·50	5·25	7·00	8·75	10·50	12·25	14·00	15·75	17·50	19·25	21·00
400·	2·33	4·67	7·00	9·33	11·67	14·00	16·33	18·67	21·00	23·33	25 67	28·00
500·	2·92	5·83	8·75	11·67	14·58	17·50	20·42	23·33	26 25	29·17	32·08	35·00
1000·	5·83	11·67	17 50	23·33	29·17	35·00	40·83	46·67	52·50	58·33	64·17	70·00

A sum at simple interest, at 5 per cent., will double in 20 years. At 6 per cent. it will double in 16⅔ years.

A sum at compound interest, at 5 per cent per annum, will double in 14 years and 2½ months. A sum at compound interest, at 6 per cent, will double in 11 years and 10¼ months.

COMPOUND INTEREST,—FOR SAVINGS BANKS, &c.

This Table contains the amount of $1 or £1 at the rates of 3, 3½, 4, 4½, 5, 6, and 7 per cent., compound interest, in dollars and decimals of a dollar, from 1 to 40 years. The amount of any given sum is found by multiplying the amount of $1 found in the Table at the given rate per cent., and for the given time. If a greater number of years is required, multiply the amount by the years.

Y'rs.	3 per Cent.	3 1-2 per Ct.	4 per Cent.	4 1-2 per Ct.	5 per Cent	6 per Cent.	7 per Cent.
1	1.03000	1.03500	1.04000	1.04500	1.05000	1.06000	1.070000
2	1.06090	1.07122	1.08160	1.09202	1.10250	1.12360	1.144900
3	1.09273	1.10872	1 12486	1.14117	1.15762	1.19102	1.225043
4	1.12551	1.14752	1.16986	1.19252	1.21551	1.26248	1.310796
5	1.15927	1.18769	1.21665	1.24618	1.27628	1.33823	1.402552
6	1.19405	1.22925	1 26532	1.30226	1.34010	1.41852	1.500730
7	1.22987	1.27228	1.31593	1.36086	1.40710	1 50363	1.605781
8	1.26677	1.31681	1.36857	1.42210	1.47745	1.59385	1.718186
9	1.30477	1.36290	1.42331	1.48609	1.55133	1.68948	1.838459
10	1.34392	1.41060	1.48024	1.55297	1.62889	1.79085	1.967151
11	1.38423	1.45997	1.53945	1.62285	1.71034	1.89830	2.104852
12	1.42576	1.51107	1.60103	1.69588	1.79586	2.01220	2.252192
13	1.46853	1.56396	1.66507	1.77220	1.88565	2.13293	2.409845
14	1.51259	1.61869	1.73168	1 85194	1.97993	2.26090	2.578534
15	1.55797	1.67535	1.80094	1.93528	2.07893	2.39656	2.759031
16	1.60471	1.73399	1.87298	2.02237	2.18287	2.54035	2 952164
17	1.65285	1.79467	1 94790	2.11338	2.29202	2.69277	3.158815
18	1.70243	1.85749	2.02582	2.20848	2 40662	2.85434	3.379931
19	1.75351	1.92250	2.10685	2.30786	2.52695	3.02560	3.616526
20	1.80611	1.98979	2.19112	2.41171	2.65330	3.20713	3.869683
21	1.86029	2.05943	2.27877	2.52024	2.78596	3.39956	4.140561
22	1.91610	2.13151	2.36992	2.63365	2.92526	3.60354	4.430400
23	1.97359	2.20611	2.46471	2.75217	3.07152	3.81975	4.740528
24	2 03279	2.28333	2 56330	2.87601	3.22510	4.04893	5.072365
25	2.09378	2.36324	2.66584	3.00543	3.38635	4.29187	5.427431
26	2.15659	2.44596	2.77247	3.14068	3.55567	4.54938	5.807351
27	2.22129	2.53157	2.88337	3.28201	3.73346	4.82275	6.213868
28	2.28793	2.62018	2.99870	3.42970	3.92013	5.11169	6.648838
29	2.35656	2.71198	3.11865	3.58404	4.11614	5.41839	7.114255
30	2 42726	2.80679	3.24340	3.74532	4.32194	5.74349	7.612253
31	2 50008	2.90503	3.37313	3.91396	4.53804	6.08810	8.145110
32	2.57508	3.00671	3.50806	4.08998	4.76494	6.45339	8.715268
33	2.65233	3.11194	3.64838	4.27403	5.00319	6.84059	9.325337
34	2.73190	3.22086	3.79432	4.46636	5.25335	7.25102	9.978110
35	2.81386	3.33359	3.94609	4.66735	5.51601	7 68609	10.676578
36	2.89828	3.45027	4.10393	4.87738	5.79182	8.14725	11.423939
37	2.98523	3.57102	4.26809	5.09686	6.08141	8.63609	12.223614
38	3.07478	3.69601	4.43881	5.32622	6.38548	9.15425	13.079277
39	3.16703	3.82537	4.61637	5.56590	6.70475	9.70351	13.994827
40	3·26204	3.95926	4.80102	5.81636	7.03999	10.28572	14.974465

SHOWING THE TIME IN WHICH A SUM WILL DOUBLE ITSELF, WHEN LENT AT THE FOLLOWING RATES OF INTEREST.

Rate per cent.	Time in which a Sum will double.		Rate per cent.	Time in which a Sum will double.	
	Simple Interest.	Compound Int.		Simple Interest.	Compound Int.
2	50 years.	35 years 1 day.	5	20 years.	14 years 75 days.
2 1-2	40 years.	28 years 26 days.	6	16 years 8 months.	11 years 327 days.
3	33 years 4 months.	23 years 164 days.	7	14 years 104 days.	10 years 89 days.
3 1-2	28 years 208 days.	20 years 54 days.	8	12 1-2 years.	9 years 2 days.
4	25 years.	17 years 246 days.	9	11 years 40 days.	8 years 16 days.
4 1-2	22 years 81 days.	15 years 278 days.	10	10 years.	7 years 100 days.

Example.—To ascertain the number of days from May 15 to Oct. 15, look opposite May in the column where October is marked, and the number will be found to be 153.

TABLE for Banking and Equation, showing the number of days from any Date in one Month, to the same Date in any other Month. — Example. How many days from the 2d of February to the 2d of August? Look for February at the left hand, and August at the top, in the angle is 181.

1855. From To	Jan.	Feb.	Mar.	April	May.	June.	July.	Aug.	Sep.	Oct.	Nov	Dec.
Jan.	365	31	59	90	120	151	181	212	243	273	304	334
Feb.	334	365	28	59	89	120	150	181	212	242	273	03
Mar.	306	337	365	31	61	92	122	153	184	214	245	275
April.	275	306	334	365	30	61	91	122	153	183	214	244
May.	245	276	304	335	365	31	61	92	123	153	184	214
June.	214	245	273	304	334	365	30	61	92	122	153	183
July.	184	215	243	274	304	335	365	31	62	92	123	153
Aug.	153	184	212	243	273	304	334	365	31	61	92	122
Sep.	122	153	181	212	242	273	303	334	365	30	61	91
Oct.	92	123	151	182	212	243	273	304	335	365	31	61
Nov.	61	92	120	151	181	212	242	273	304	334	365	30
Dec.	31	62	90	121	151	182	212	243	274	304	335	365

Example.—A Bill drawn March 29, at 3 months, is due June 29, but adding 3 days' grace, it is not payable till July 2. Find the number of days by the Table.

NOTE.—If Leap-Year, add one Day if February be included.

EQUATION OF PAYMENTS.

RULE. — Multiply each Debt by the time in which it is Payable, and divide the Sum of the Products by the Sum of the Debts—as follows:

Bought at 4 months' credit. When is the equated time of payment?

1855.	*Am't.*		*Days.*	*Products.*
March 1.	$ 50.00			
" 7.	67 00	Multiplied by	6 equal	402 00
" 12.	32.00	"	" 11 "	352.00
" 19.	82.00	"	" 18 "	1476.00
	$ 231.00			) 2230.00 (9 days.
				2079.00

2230.00 being divided by 231.00 gives 9 days and 151.00 as the remainder, which latter being more than half of 231.00, counts a whole day.

The column of days represents the number of days after July 1 (4 months after March 1,) at which time the several debts become payable. The quotient 9 days (and the remainder) added to July 1 gives July 11 for the equated time.

ANOTHER METHOD FOR FINDING THE AVERAGE PAYMENT OF DIFFERENT PAYMENTS.

RULE. — Find the *interest*, by Interest Tables, on *each* item from the date of *each* charge to the date of the last charge. Add up the interest of these several charges, and then ascertain how long a time it will take for the *total* of the account to make that amount of Interest—then deduct this time from the date of the last charge in the account, and this will give you the month and day of the average. Cents may be disregarded unless over 50, and counting them as an additional dollar if they are 50 or more.

Bought at 4 months. When is the average time of payment.?

March 1,	$200.	From March 1 to July 1 is 122 days.—Interest	$ 4	07
April 2,	70.	" April 2 to July 1 is 90 days.— "	1	05
May 4,	30.	" May 4 to July 1 is 58 days.— "		29
June 6,	50.	" June 6 to July 1 is 25 days.— "		21
July 1,	50.			
	$400.		$5	61

The Interest on $400, for 2 months and 24 days is $5 60. Now deduct the amount of time (2 months and 24 days) from the date of the last charge, (July 1,) and this will give April 6, as the month and day for the *average*, and Aug. 6th as the day of payment.

PRODUCE AND MERCHANDISE READY RECKONERS.

HAY, BUTTER, CHEESE, LARD, AND OTHER PRODUCE.

READY RECKONER, to find the Price of any Number of Pounds, at the Rate of 2000 Pounds to the Ton.

Lbs.	*cts* 25	*cts* 50	*cts* 75	$ *ct* 1·00	$ *ct* 2·00	$ *ct* 3·00	$ *ct* 4·00	$ *ct* 5·00	$ *ct* 6·00	$ *ct* 7·00	$ *ct* 8·00	$ *ct* 9·00	$ *cts* 10·00	$ *cts* 11·00	$ *cts* 12·00
3	—	—	—	—	—	—	·1	·1	·1	·1	·1	·1	·2	·2	·2
7	..	..	..	..	..	·1	·1	·2	·2	·2	·3	·3	·4	·4	·4
10	..	..	..	·1	·1	·2	·2	·3	·3	·4	·4	·5	·5	·6	·6
20	..	·1	·1	·1	·2	·3	·4	·5	·6	·7	·8	·9	·10	·11	·12
30	..	·1	·1	·2	·3	·5	·6	·8	·9	·11	·12	·14	·15	·17	·18
40	1	·1	·2	·2	·4	·6	·8	·10	·12	·14	·16	·18	·20	·22	·24
50	1	·1	·2	·3	·5	·9	·10	·13	·15	·18	·20	·23	·25	·28	·30
60	1	·2	·2	·3	·6	·9	·12	·15	·18	·21	·24	·27	·30	·33	·36
70	1	·2	·3	·4	·7	·11	·14	·18	·21	·25	·28	·32	·35	·39	·42
80	·1	·2	·3	·4	·8	·12	·16	·20	·24	·28	·32	·36	·40	·44	·48
90	·1	·2	·3	·5	·9	·14	·18	·23	·27	·32	·36	·41	·45	·50	·54
100	·1	·3	·4	·5	·10	·15	·20	·25	·30	·35	·40	·45	·50	·55	·60
200	·3	·5	·8	·10	·20	·30	·40	·50	·60	·70	80	·90	1·00	1·10	1·20
300	·4	·8	·11	·15	·30	·45	·60	·75	·90	1·05	1·20	1·35	1·50	1·65	1·80
400	·5	·10	·15	·20	·40	·60	·80	1·00	1·20	1·40	1·60	1·80	2·00	2·20	2·40
500	·6	·13	·19	·25	·50	·75	1·00	1·25	1·50	1·75	2·00	2·25	2·50	2·75	3·00
600	·8	·15	23	·30	·60	·90	1·20	1·50	1·80	2·10	2·40	2·70	3·00	3·3	3·60
700	·9	·18	·26	·35	·70	1·05	1·40	1·75	2·10	2·45	2·80	3·15	3·50	3·85	4·20
800	·10	·20	·30	·40	·80	1·20	1·60	2·00	2·40	2·80	3·20	3·60	4·00	4·40	4·80
900	·11	·23	·34	·45	·90	1·35	1·80	2·25	2·70	3·15	3·60	4·05	4·50	4·95	5·40
1000	·13	·25	·38	·50	1·00	1·50	2·00	2·50	3·00	3·50	4·00	4·50	5·00	5·50	6·00
1100	·14	·28	·41	·55	1·10	1·65	2·20	2·75	3·30	3·85	4·40	4·95	5·50	6·05	6·60
1200	·15	·30	·45	·60	1·20	1·80	2·40	3·00	3·60	4·20	4·80	5·40	6·00	6·60	7·20
1300	·16	·33	·49	·65	1.30	1·95	2 60	3·25	3 90	4·55	5·20	5·85	6·50	7·15	7·80
1400	·18	·35	·53	·70	1·40	2·10	2·80	3·50	4·20	4·90	5·60	6·30	7·00	7·70	8 40
1500	·19	·38	·56	·75	1·50	2·25	3·00	3·75	4 50	5·25	6·00	6·75	7·50	8·25	9·00
1600	·20	·40	·60	·80	1·60	2·40	3·20	4·00	4 80	5·60	6·40	7·20	8 00	8·80	9·60
1700	.21	·43	·64	·85	1·70	2 55	3·40	4·25	5·10	5·95	6·80	7·65	8·50	9 35	10 20
1800	·23	·45	·68	·90	1·80	2·70	3·60	4·50	5·40	6 30	7·20	8·10	9·00	9·90	10·80
1900	·24	·48	·71	·95	1·90	2·85	3·80	4·75	5·70	6·65	7·60	8·55	9·50	10·45	11·40

Lbs.	$ *cts* 13·00	$ *cts* 14·00	$ *cts* 15·00	$ *cts* 16·00	$ *cts* 17·00	$ *cts* 18·00	$ *cts* 19·00	$ *cts* 20·00	$ *cts* 25·00	$ *cts* 30·00	$ *cts* 40·00	$ *cts* 50·00
3	·2	·2	·2	·2	·3	·3	·3	·3	·4	·5	·6	·8
7	·5	·5	·5	·6	·6	·6	·7	·7	·9	·11	·14	·18
10	·7	·7	·8	·8	·9	·9	·10	·10	·13	·15	·20	·25
20	·13	·14	·15	·16	·17	·18	·19	·20	·25	·30	·40	·50
30	·20	·21	·23	·24	·26	·27	·29	·30	·38	·45	·60	·75
40	·26	·28	·30	·32	·34	·36	·38	·40	·50	·60	·80	1·00
50	·33	·35	·38	·40	·43	·45	·48	·50	·63	·75	1·00	1·25
60	·39	·42	·45	·48	·51	·54	·57	·60	·75	·90	1·20	1·50
70	·46	·49	·53	·56	·60	·63	·67	·70	·88	1·05	1·40	1·75
80	·52	·56	·60	·64	·68	·72	·76	·80	1 00	1·20	1·60	2·00
90	·59	·63	·68	·72	·77	·81	·86	·90	1·13	1·35	1·80	2·25
100	·65	·70	·75	·80	·85	·90	·95	1·00	1·25	1·50	2·00	2·50
200	1·30	1·40	1·50	1·60	1·70	1 80	1 90	2·00	2·50	3·00	4·00	5·00
300	1·95	2·10	2·25	2·40	2·55	2·70	2·85	3·00	3·75	4·50	6·00	7·50
400	2·60	2·80	3·00	3·20	3·40	3·60	3·80	4·00	5·00	6·00	8·00	10·00
500	3·25	3·50	3·75	4·00	4·25	4·50	4·75	5·00	6·25	7·50	10·00	12·50
600	3·90	4·20	4·50	4·80	5·10	5·40	5·70	6·00	7·50	9·00	12·00	15 00
700	4·55	4·90	5·25	5·60	5·95	6·30	6·65	7·00	8·75	10·50	14·00	17·50
800	5·20	5·60	6·00	6·40	6·80	7·20	7·60	8·00	10·00	12·00	16·00	20 00
900	5·85	6·30	6·75	7·20	7·65	8·10	8·55	9·00	11·25	13·50	18·00	22·50
1000	6·50	7·00	7·50	8·00	8·50	9·00	9·50	10·00	12·50	15·00	20·00	25·00
1100	7·15	7·70	8·25	8·80	9·35	9·90	10·45	11·00	13·75	16·50	22·00	27·50
1200	7·80	8·40	9·00	9·60	10·20	10·80	11·40	12·00	15·00	18·00	24·00	30·00
1300	8·45	9·10	9·75	10·40	11·05	11·70	12·35	13·00	16·25	19·50	26·00	32·50
1400	9·10	9 80	10·50	11·20	11·90	12·60	13·30	14·00	17·50	21·00	28·00	35·00
1500	9·75	10·50	11·25	12·00	12·75	13·50	14·25	15·00	19·75	22·50	30·00	37·50
1600	10·40	11·20	12·00	12·80	13·60	14 40	15·20	16·00	20·00	24·00	32·00	40·00
1700	11·05	11·90	12·75	13·60	14·15	15·30	16·15	17·00	21·25	25·50	34·00	42·50
1800	11·70	12 60	13·50	14·40	15·30	16·20	17·10	18·00	22·50	27.00	36·00	45·00
1900	12 35	13·30	14·25	15·20	16·15	17·10	18·05	19·00	23 75	28 50	38·00	47·50

If the No. required is not in the Tables, add the amounts of two numbers together.

READY RECKONER, to find the Price of any Number of Pounds, at the Rate of 2240 pounds to the Ton.

Lbs.	cts ·25	cts ·50	cts ·75	$ ct 1·00	$ ct 2·00	$ ct 3·00	$ ct 4·00	$ ct 5·00	$ ct 6·00	$ ct 7·00	$ ct 8·00	$ ct 9·00	$ cts 10·00	$ cts 11·00	$ cts 12·00
10	..	..	..	..	..	·1	·2	·2	·3	·3	·4	·4	·4	·5	·5
15	..	..	..	..	·1	·2	·3	·3	·4	·5	·5	·6	·7	·7	·8
20	..	..	..	..	·2	·3	·4	·4	·5	·6	·7	·8	·9	·10	·11
25	..	..	..	·1	·2	·3	·4	·5	·7	·8	·9	·10	·11	·12	·13
30	..	..	·1	·1	·3	·4	·5	·7	·8	·9	·11	·12	·13	·15	·16
40	..	..	·1	·2	·4	·5	·7	·9	·11	·13	·14	·16	·18	·20	·21
50	..	·1	·2	·2	·4	·6	·9	·11	·13	·16	·18	·20	·22	·25	·27
60	..	·1	·2	·3	·5	·8	·11	·13	·16	·19	·21	·24	·27	·29	·32
70	..	·2	·2	·3	·6	·9	·12	·15	·19	·22	·25	·28	·31	·34	·37
80	..	·2	·3	·4	·7	·11	·14	·18	·21	·25	·29	·32	·36	·39	·43
90	..	·2	·3	·4	·8	·12	·16	·20	·24	·28	·32	·36	·40	·44	·48
100	·1	·2	·3	·4	·9	·13	·18	·22	·27	·31	·36	·40	·45	·49	·54
200	·2	·4	·6	·9	·18	·27	·36	·45	·54	·63	·71	·80	·89	·98	1·07
300	·3	·7	·10	·13	·27	·40	·54	·67	·80	·94	1·07	1·21	1·34	1·47	1·61
400	·4	·9	·13	·18	·36	·54	·71	·89	1·07	1·25	1·43	1·61	1·79	1·96	2·14
500	·6	·11	·17	·22	·45	·67	·89	1·12	1·34	1·56	1·79	2·01	2·23	2·46	2·68
600	·7	·13	·20	·27	·54	·80	1·07	1·34	1·61	1·88	2·14	2·41	2·68	2·95	3·21
700	·8	·16	·23	·31	·63	·94	1·25	1·56	1·87	2·19	2·50	2·81	3·12	3·44	3·75
800	·9	·18	·27	·36	·71	1·07	1·43	1·79	2·14	2·50	2·86	3·21	3·57	3·93	4·29
900	·10	·20	·30	·40	·80	1·21	1·61	2·01	2·41	2·81	3·21	3·62	4·02	4·42	4·82
1000	·11	·22	·33	·45	·89	1·34	1·79	2·23	2·68	3·13	3·57	4·02	4·46	4·91	5·36
1100	·12	·25	·37	·49	·98	1·47	1·96	2·46	2·95	3·44	3·93	4·42	4·91	5·40	5 89
1200	·13	·27	·40	·54	1·07	1·61	2·14	2·68	3·21	3·75	4·29	4·82	5·36	5·89	6·43
1300	·14	·29	·44	·58	1·16	1·74	2·32	2·90	3·48	4·06	4·64	5·22	5·80	6·38	6·96
1400	·16	·31	47	·62	1·25	1·87	2·50	3.12	3·75	4·38	5·00	5·62	6·25	6·87	7·50
1500	·17	·33	·50	·67	1·34	2·01	2·68	3·35	4·02	4·69	5·36	6·03	6·70	7·37	8·04
1600	·18	·36	·54	·71	1·43	2·14	2·86	3.57	4·28	5·00	5·71	6·43	7·14	7·86	8·57
1700	·19	·38	·57	·76	1·52	2·28	3·03	3·79	4·56	5·31	6·07	6·83	7·59	8·35	9·11
1800	·20	·40	·60	·80	1·61	2·41	3·21	4·02	4·82	5·63	6·43	7·23	8·04	8·84	9·64
1900	·21	·42	·64	·85	1·70	2·54	3·39	4·24	5·09	5·94	6·78	7·63	8·48	9·33	10·18
2000	·22	·45	·67	·89	1·78	2·68	3·57	4·46	5·36	6·25	7·14	8·03	8·93	9·82	10·71
2100	·23	·47	·70	·94	1·87	2·81	3·75	4·69	5·62	6·56	7·50	8·44	9·37	10·31	11·25

Lbs.	$ cts 13·00	$ cts 14·00	$ cts 15·00	$ cts 16·00	$ cts 17·00	$ cts 18·00	$ cts 19·00	$ cts 20·00	$ cts 21·00	$ cts 22·00	$ cts 23·00	$ cts 24·00
10	·6	·6	·7	·7	·8	·8	· 8	· 9	· 9	·10	·10	·11
15	·9	·9	·10	·11	·11	·12	·13	·13	14	·15	·15	·16
20	·12	·13	·13	·14	·15	·16	·17	·18	·19	·20	·21	·21
25	·15	·16	·17	·18	·19	·20	·21	22	·23	·25	·26	·27
30	·17	·19	·20	·21	·23	·24	·25	27	·28	·29	·31	·32
40	·23	·25	·27	·29	·30	·32	·34	36	·38	·39	·41	·43
50	·29	·31	·33	·36	·38	·40	·42	·45	·47	·49	·51	·54
60	·35	·38	·40	·43	·46	·48	·51	·54	·56	·59	·62	·64
70	·41	·44	·47	·50	·53	·56	·59	·62	·66	·69	·72	·75
80	·46	·50	·54	·57	·61	·64	·68	·71	·75	·79	·82	·86
90	·52	·56	·60	·64	·68	·72	·76	·80	·84	·88	·92	·96
100	·58	·63	·67	·71	·76	·80	·85	·89	·94	·98	1·03	1·07
200	1·16	1·25	1·34	1·42	1·52	1·61	1·70	1·79	1·88	1·96	2·05	2·14
300	1·74	1·88	2·01	2·14	2·28	2·41	2·54	2·68	2·81	2·95	3·08	3·21
400	2·32	2·50	2·68	2·86	3·04	3·21	3·39	3·57	3·75	3·93	4·11	4·29
500	2·90	3·13	3·35	3·57,	3·79	4·02	4·24	4·46	4·69	4·91	5·13	5·36
600	3·48	3·75	4·02	4·29	4·55	4·82	5·09	5·36	5·63	5·89	6·16	6·43
700	4·06	4·38	4·69	5·00	5·31	5·62	5·94	6·25	6·56	6·87	7·19	7·50
800	4·64	5·00	5·36	5·71	6·07	6·43	6·79	7·14	7·50	7·86	8·21	8·57
900	5·22	5·63	6·03	6·43	6·83	7·23	7·63	8·04	8·44	8·84	9·24	9·64
1000	5·80	6·25	6·70	7·14	7·59	8·04	8·48	8·93	9·38	9·82	10·27	10·71
1100	6·38	6·88	7·37	7·86	8·35	8·84	9·33	9·82	10·31	10·80	11·29	11·79
1200	6·96	7·50	8·04	8·57	9·11	9·64	10·18	10·71	11·25	11·79	12·32	12·86
1300	7·54	8·13	8·70	9·28	9·87	10·45	11·03	11·61	12·19	12·77	13·35	13·93
1400	8·12	8·75	9·37	10·00	10·62	11·25	11·87	12·50	13·13	13·75	14·37	15·00
1500	8·70	9·38	10·04	10·71	11·38	12·05	12·72	13·39	14·06	14·73	15·40	16·07
1600	9·28	10·00	10·71	11·43	12·14	12·86	13·57	14·28	15·00	15·71	16·43	17·14
1700	9·86	10·63	11·38	12·14	12·90	13·66	14·42	15·18	15·94	16·70	17·45	18·21
1800	10·44	11·25	12·05	12·86	13·66	14·46	15·27	16·07	16·88	17·68	18·48	19·29
1900	11·03	11·88	12·72	13·57	14·42	15·27	16·12	16·96	17·81	18·66	19·51	20·36
2000	11·61	12·50	13·39	14·28	15·18	16·07	16·96	17·86	18·75	19·64	20·53	21 43
2100	12·19	13·13	14·06	15·00	15·94	16·87	17·81	18·75	19·69	20·62	21·56	22·50

If the article cost $12·50 per ton, add the amounts under $12. and 50 cents together.

READY RECKONER, to find the Price of any Number of Pounds, at the Rate of 2240 Pounds to the Ton.—[Continued.]

Lbs.	$ cts 25·00	$ cts 26·00	$ cts 27·00	$ cts 28·00	$ cts 29·00	$ cts 30·00	$ cts 31·00	$ cts 32·00	$ cts 33·00	$ cts 34·00	$ cts 35·00	$ cts 36·00
10	·11	·12	·12	·13	·13	·13	·14	·14	·15	·15	·16	·16
15	·17	·17	·18	·19	·19	·20	·21	·21	·22	·23	·23	24
20	·22	·23	24	·25	·26	·27	·28	·29	·29	·30	·31	·32
25	·28	·29	·30	·31	·32	·33	·35	·36	·37	·38	·39	40
30	·33	·35	·36	·38	·39	·40	·41	·43	·44	·46	·47	·48
40	·45	·46	·48	·50	·52	·54	·55	·57	·59	·61	·63	·64
50	·56	·58	·60	.63	·65	·67	·69	·71	·74	·76	·78	·80
60	·67	·70	·72	·75	·78	·80	·83	·86	·88	·91	·94	·96
70	·78	·81	·84	·88	·91	·94	·97	1·00	1·03	1·06	1 09	1·12
80	·89	·93	·96	1·00	1·04	1·07	1·11	1·14	1·18	1·21	1·25	1·29
90	1·00	1·04	1·08	1·13	1·16	1·21	1·25	1·29	1·33	1·37	1·41	1·45
100	1·12	1·16	1·21	1·25	1·29	1·34	1·38	1·43	1·47	1·52	1·56	1·61
200	2·23	2·32	2·41	2·50	2·59	2·68	2·77	2·86	2·94	3·04	3·12	3·21
300	3·35	3·48	3·62	3·75	3·88	4·02	4·15	4·29	4·41	4·55	4·69	4·82
400	4 46	4·64	4·82	5·00	5·18	5·36	5·54	5·71	5·89	6·07	6·25	6·43
500	5·58	5·80	6·03	6·25	6·47	6·70	6·92	7·14	7·37	7·59	7·81	8·04
600	6 70	6·96	7·23	7·50	7·77	8·04	8·30	8·57	8·84	9·11	9·38	9·64
700	7·81	8·12	8·44	8·75	9·06	9·37	9·69	10·00	10·31	10·62	10·94	11 25
800	8·93	9·29	9·64	10·00	10·36	10·71	11·07	11·43	11·79	12·14	12·50	12·86
900	10·04	10·45	10·85	11·25	11·65	12·05	12·46	12·86	13·26	13·66	14·06	14·46
1000	11·16	11·61	12·05	12·50	12·95	13·39	13·84	14·29	14·73	15·18	15·63	16·07
1100	12·28	12·77	13·26	13·75	14·24	14·73	15·22	15·71	16·21	16·70	17·19	17·68
1200	13·39	13·93	14·46	15·00	15·54	16·07	16·61	17·14	17·68	18·21	18 75	19 29
1300	14·51	15·09	15·67	16·25	16·83	17·41	17·99	18·57	19·15	19·73	20·31	20·89
1400	15·62	16·25	16·87	17·50	18·12	18·75	19·37	20·00	20·62	21·25	21·88	22·50
1500	16·74	17·41	18·08	18·75	19·42	20·09	20·76	21·43	22·10	22·77	23 44	24·11
1600	17·86	18·57	19·28	20·00	20·71	21 43	22·14	22·86	23·57	24·28	25 00	25·71
1700	18 97	19·73	20·49	21·25	22·00	22·77	23·53	24·28	25·04	25·80	26·56	27 32
1800	20·09	20·89	21·70	22·50	23·30	24·11	24·91	25·71	26·52	27·32	28·13	28·93
1900	21·20	22·05	22·90	23·75	24·60	25·44	26·29	27·14	27·99	28·84	29 69	30·53
2000	22·32	21·21	24·10	25·00	25·89	26·78	27·67	28·57	29·46	30·36	31·25	32·14
2100	23·44	24·37	25·31	26·25	27·19	28·12	29·06	30·00	30·93	31·87	32·81	33·75

Lbs.	$ cts 37·00	$ cts 38· 0	$ cts 39·00	$ cts 40·00	$ cts 41·00	$ cts 42·00	$ cts 43·00	$ cts 44·00	$ cts 45·00	$ cts 50·00	$ cts 55 00	$ cts 60·00
10	·17	·17	·17	·18	·18	·19	·19	·20	·20	·22	·25	·27
15	·25	·25	·26	·27	·27	·28	·29	·29	·30	·33	·37	40
20	·33	·34	·35	·36	·37	·38	·38	·39	·40	·45	·49	·54
25	·41	·42	·44	·45	·46	·47	·48	·49	·50	·56	·61	·67
30	·50	·51	·52	·54	·55	·56	·57	·59	·60	·67	·74	·80
40	·66	·68	·70	·71	·73	·75	·77	·79	·80	·89	·98	1·07
50	·83	·85	·87	·89	·92	·94	·96	·98	1·00	1·12	1·23	1·34
60	·99	1·02	1·04	1·07	1·10	1·13	1·15	1·18	1·20	1·34	1·47	1·61
70	1·16	1·19	1·21	1·25	1·28	1·31	1·34	1·37	1·41	1·56	1·72	1·87
80	1·32	1·36	1·39	1·43	1·46	1·50	1·54	1·57	1·61	1·79	1·96	2·14
90	1·49	1·53	1·57	1·61	1·65	1·69	1·73	1·77	1·81	2·01	2·21	2·41
100	1·65	1·70	1·74	1·79	1·83	1·88	1·92	1·96	2·01	2·23	2·46	2·68
200	3 30	3·39	3·48	3·57	3·66	3·75	3·84	3·93	4·02	4·46	4·91	5·36
300	4·96	5·09	5·22	5·36	5·49	5·63	5·76	5·89	6·03	6·70	7·37	8·04
400	6·61	6·79	6·96	7·14	7·32	7·50	7·68	7·86	8·04	8·93	9·82	10·71
500	8·26	8·48	8·71	8·93	9·15	9·38	9·60	9·82	10·04	11·16	12·28	13·39
600	9·91	10·18	10·45	10·71	10·98	11·25	11·52	11·79	12·05	13·39	14·73	16·07
700	11·56	11·87	12·19	12·50	12·81	13·13	13·44	13·75	14·06	15·62	17·19	18·75
800	13·21	13·57	13·93	14·29	14·64	15·00	15·36	15·71	16 07	17·86	19 64	21·43
900	14·87	15 27	15·67	16·07	16·47	16·88	17·28	17·68	18·08	20·09	22·10	24·11
1000	16·52	16·96	17·41	17·86	18·30	18 75	19 20	19·64	20 09	22 32	24·55	26·79
1100	18·17	18·66	19·15	19·64	20·13	20·63	21·12	21·61	22·10	24·55	27·01	29·46
1200	19·82	20·36	20·89	21·43	21·96	22·50	23·04	23·57	24·11	26·79	29·46	32·14
1300	21·47	22 05	22·63	23·21	23·79	24·38	24.95	25·53	26·12	29·02	31·92	34 82
1400	23·12	23·75	24·37	25·00	25·62	26 25	26·87	27·50	28·12	31·25	34·37	37·50
1500	24 78	25·45	26·12	26·79	27·45	28·13	28·79	29·46	30·13	33·48	36·83	40·18
1600	26·43	27·14	27·86	28·57	29·28	30·00	30·71	31·43	32·14	35·71	39·28	42·86
1700	28·08	28·84	29·60	30·36	31·12	31·88	32·63	33·39	34·15	37·95	41·74	45·53
1800	29·73	30·54	31·34	32·14	32·95	33·75	34·55	35·36	36·16	40·18	44·20	48·21
1900	31·38	32·23	33·08	33·93	34·78	35·63	36·47	37·32	38·17	42·41	46·65	50·89
2000	33·03	33·93	34·82	35·71	36·61	37·50	38·39	39·28	40·18	44·64	49·11	53·57
2100	34·68	35·63	36·56	37·50	38·44	39 38	40·31	41·25	42·19	46·87	51·56	56·25

UNITED STATES NAVY RATION.

SEC. 1. *Be it enacted by the Senate and House of Representatives of the United States of America, in General Congress assembled:* —

SEC. 1. Relates to the daily allowance.

DAYS OF THE WEEK.	POUNDS.						OUNCES.							FRACT'NS OF A PINT.			
	Beef.	Pork.	Flour.	Rice.	Raisins or dried fruit.	Pickles or Cranberries.	Biscuit.	Sugar.	Either. Tea.	Either. Coffee.	Either. Cocoa.	Butter.	Cheese.	Beans.	Molasses.	Vinegar.	Spirits.
Sunday,	1		½		¼		14	2		1	1						¼
Monday,		1					14	2	½	1	1			½			¼
Tuesday,	1			½			14	2	¼	1	1	2	2				¼
Wednesday,		1				¼	14	2	¼	1	1			½			¼
Thursday,	1		½		¼		14	2	¼	1	1						¼
Friday,	1			½			14	2	¼	1	1	2	2		½		¼
Saturday,		1				¼	14	2	¼	1	1			½		½	¼
Weekly quantity,	4	3	1	1	½	½	98	14	1¾	7	7	4	4	1½	½	½	1¾

SEC. 2. Fresh meat may be substituted for salt beef or pork, and vegetables and sauerkraut for the other articles usually issued with the salted meats, allowing one and a quarter pounds of fresh meat for one pound of salted beef or pork, and regulating the quantity of vegetables, or sauerkraut, so as to equal the value of those articles for which they may be substituted.

SEC. 3. That, should it be necessary to vary the above-described daily allowance, it shall be lawful to substitute one pound of soft bread, or one pound of flour, or half a pound of rice, for fourteen ounces of biscuit; half a pint of wine for a gill of spirits; half a pound of rice for half a pint of beans or pease; half a pint of beans or pease for half a pound of rice.

When it may be deemed expedient, the articles of butter, cheese, raisins, dried apples, or other dried fruits, pickles and molasses, may be substituted for each other and for spirits: *Provided*, The articles substituted shall not exceed in value the article for which it may be issued, according to the scale of prices.

SEC. 4. Relates to cases of necessity when the daily allowance may be diminished or varied.

SEC. 5. Permits the relinquishment of the spirit part of the ration, and allows money to be paid in lieu thereof.

VALUATION OF THE WEEKLY QUANTITY.

3 pounds of pork, at 7½ cents per pound, 22 cents; 4 pounds of beef, at 6 cents per pound, 24 cents; 1 pound of flour, at 4 cents per pound, 4 cents; 1 pound of rice, at 3 cents per pound, 3 cents; ½ pound of raisins, &c., at 13 cents per pound, 6½ cents; ½ pound of pickles, &c., at 12½ cents per pound, 6¼ cents; 98 ounces of biscuit, at 4 cents per pound, 24½; 14 ounces of sugar, at 8 cents per pound, 7 cents; 1¾ ounces of tea, 7 ounces of coffee, 7 ounces of cocoa, (all of the same value,) at 25 cents per pound, 8¾ cents; 4 ounces of butter, at 23 cents per pound, 5¾ cents; 4 ounces of cheese, at 16 cents per pound, 4 cents; 1½ pints of beans, at 24 cents per gallon, 4½ cents; ½ pint of molasses, at 64 cents per gallon, 4 cents; ½ pint of vinegar, at 20 cents per gallon, 1¼ cents; 1¾ pints of spirits, at 64 cents per gallon, 14 cents. Averaging 20 cents per day, or weekly, 1 40.

ENGLISH SCALE FOR VICTUALLING MERCHANT VESSELS, FOR ONE LUNAR MONTH.

[Made up from a Scale promulgated under the authority of a Committee of the General Ship Owners' Society of London.]

No. of Men to be victualled for a Lunar month.	PROPORTION OF EACH SPECIES OF PROVISION FOR A LUNAR MONTH, OR 28 DAYS.								
	Salted Beef and Pork, each.	Flour.	Rice.	Pease.	In lieu of Spirits.			Water.
					Sugar.	Tea.	Coffee, Cocoa, &c. as substitutes	
	lbs. oz.	lbs.	lbs.	gal. pts	lbs.	lbs. oz.	lbs. oz.	galls.
1	17 8	6	4	0 3½	3	0 7	1 12	21
2	35 0	12	8	0 7	6	0 14	3 8	42
3	52 8	18	12	1 2½	9	1 5	4 4	63
4	70 0	24	16	1 6	12	1 12	6 0	84
5	87 8	30	20	2 1½	15	2 3	8 12	105
6	105 0	36	24	2 5	18	2 10	10 8	126
7	122 8	42	28	3 0½	21	3 1	12 4	147
8	140 0	48	32	3 4	24	3 8	14 0	168
9	157 8	54	36	3 7½	27	3 15	15 12	189
10	175 0	60	40	4 3	30	4 6	17 8	210
11	192 8	66	44	4 6½	33	4 13	19 4	231
12	210 0	72	48	5 2	36	5 4	21 0	252
13	227 8	78	52	5 5½	39	5 11	22 12	273
14	245 0	84	56	6 1	42	6 2	24 8	294
15	262 8	90	60	6 4½	45	6 9	26 4	315
16	280 0	96	64	7 0	48	7 0	28 0	336
17	297 8	102	68	7 3½	51	7 7	29 12	357
18	315 0	108	72	7 7	54	7 14	31 8	378
19	332 8	114	76	8 2½	57	8 5	33 4	399
20	350 0	120	80	8 6	60	8 12	35 0	420
25	437 8	150	100	10 7½	75	10 15	43 12	525
30	525 0	180	120	13 1	90	13 2	52 8	630
35	612 8	210	140	15 2½	105	15 5	61 4	735
40	700 0	240	160	17 4	120	17 8	70 0	840
45	787 8	270	180	19 5½	135	19 11	78 12	945
50	875 0	300	200	21 7	150	21 14	87 8	1050

REMARKS.

1. As much bread is allowed to seamen as they can eat without waste

2. As the allowance of salted beef and pork is the same, the second column contains the quantity of *each*, and in taking the proportions from the table, the amount must be doubled, to obtain the necessary supply of salted provisions; or taken out twice, once for salt beef, and then for salt pork.

3. Should the substitutes for tea be given for 14 days, half only of each quan-

tity expressed in the 7th and 8th columns will be necessary; and thus for any similar proportion of time.

PROBLEM.

Given the number of days for which it is required to victual a ship's crew, consisting of a given complement of men, with each species of provision.

Multiply the proportions in the columns against the complement of men, by the number of months for which they are to be provisioned, and the products will be the required quantities

EXAMPLE.

A ship's crew, consisting of 40 men, are to be provisioned for five lunar months, or 140 days: required the proportion of each species of sea provisions.

Against 40 in the table (the complement of men) will be found the quantities required for one lunar month which multiplied by five, produces the following quantities of each kind of provisions:—viz., 3500 lbs. of beef, and the *same* quantity of pork, 1200 lbs. of flour; 800 lbs. of rice; 87 gals. 4 pts. of pease; 600 lbs of sugar; 87 lbs. 8 oz of tea, or of its equivalents, coffee, cocoa, or chocolate 350 lbs.; and 4200 galls. of water.

REMARKS.

The salt beef being generally cut into pieces of 8 lbs. each, and the salt pork in 4 lbs. pieces; the pounds of salt beef being divided by eight, and the pounds of salt pork by four, their respective quotients will give the number of pieces of each kind of meat. Thus, in the above example, the quantity will be 437 1-2 pieces of salt beef, and 875 pieces of salt pork.

SHORT ALLOWANCE.

In the English Merchant Service, if the crew are put on short allowance, they are allowed, while such short allowance continues, four pence per day, if the reduction is one-third, and eight pence per day if more than one-third.

SUBSTITUTES.

1 oz. of Coffee, or Cocoa, or Chocolate, may be substituted for one-fourth oz. of Tea.

Molasses for Sugar; the quantity to be one-half more.

1 lb. Potatoes or Yams to be considered equal to half a pound of Flour or Rice or a quarter of a pint of Pease.

When Fresh Meat is issued, the proportion to be 2 lbs. per man, per day, in lieu of Salt Meat, Flour, Rice, and Pease.

The allowance of Small Stores being considered as an equivalent for Spirits, Spirits are only to be issued under particular circumstances at the discretion of the Master.

Lime or Lemon Juice, Sugar, and Vinegar, are to be served out to the Crew whenever they shall have been consuming Salt Provisions for *Ten Days*. The Lime or Lemon Juice and Sugar daily, after the rate of half an ounce of each per day, and the Vinegar weekly, at the rate of half a pint per week to each person as long as the consumption of Salt Provisions is continued.

DECIMAL TABLES

FOR

FACILITATING CALCULATIONS.

DECIMAL TABLES.

Decimals equivalent to the number of Gills or fractional parts of a Pint, Quart, or Gallon. — See Guaging, Epitome of Mensuration, &c.

[It is usual, except in cases where the number multiplied is large, to drop all but the two first figures in decimals.]

Decimals.	Gills.	Pints.	Quarts.	Gallon.	Decimals.	Gills.	Pints.	Quarts.	Gallon.	Decimals.	Gills.	Pints.	Quarts.	Gallon.
.03125	1	$\frac{1}{4}$	$\frac{1}{8}$	1-32	.375	12	3	$1\frac{1}{2}$	3-8	.71875	23	$5\frac{3}{4}$	$2\frac{7}{8}$	23-32
.0625	2	$\frac{1}{2}$	$\frac{1}{4}$	1-16	.40625	13	$3\frac{1}{4}$	$1\frac{5}{8}$	13-32	.75	24	6	3	3-4
.09375	3	$\frac{3}{4}$	$\frac{3}{8}$	3-32	.4375	14	$3\frac{1}{2}$	$1\frac{3}{4}$	7-16	.78125	25	$6\frac{1}{4}$	$3\frac{1}{8}$	25-32
.125	4	1	$\frac{1}{2}$	1-8	.46875	15	$3\frac{3}{4}$	$1\frac{7}{8}$	15-32	.8125	26	$6\frac{1}{2}$	$3\frac{1}{4}$	13-16
.15625	5	$1\frac{1}{4}$	$\frac{5}{8}$	5-32	.5	16	4	2	1-2	.84375	27	$6\frac{3}{4}$	$3\frac{3}{8}$	27-32
.1875	6	$1\frac{1}{2}$	$\frac{3}{4}$	3-16	.53125	17	$4\frac{1}{4}$	$2\frac{1}{8}$	17-32	.875	28	7	$3\frac{1}{2}$	7-8
.21875	7	$1\frac{3}{4}$	$\frac{7}{8}$	7-32	.5625	18	$4\frac{1}{2}$	$2\frac{1}{4}$	9-16	.90625	29	$7\frac{1}{4}$	$3\frac{5}{8}$	29-32
.25	8	2	1	1-4	.59375	19	$4\frac{3}{4}$	$2\frac{3}{8}$	19-32	.9375	30	$7\frac{1}{2}$	$3\frac{3}{4}$	15-16
.28125	9	$2\frac{1}{4}$	$1\frac{1}{8}$	9-32	.625	20	5	$2\frac{1}{2}$	5-8	.96875	31	$7\frac{3}{4}$	$3\frac{7}{8}$	31-32
.3125	10	$2\frac{1}{2}$	$1\frac{1}{4}$	5-16	.65625	21	$5\frac{1}{4}$	$2\frac{5}{8}$	21-32	1.000	32	8	4	1 gal.
.34375	11	$2\frac{3}{4}$	$1\frac{3}{8}$	11-32	.6875	22	$5\frac{1}{2}$	$2\frac{3}{4}$	11-16					

APPLICATION. Required the *gallons* in any Cylindrical Vessel. Suppose a vessel 9 1-2 inches deep, 9 inches diameter, and contents 2·6163, that is, 2 gallons and 61 hundredth parts of a gallon, now to ascertain this decimal of a gallon refer to the above Table, for the decimal that is nearest, which is ·625, opposite to which is 20 gills, 5 pints, and 2 1-2 quarts, either being the amount of the decimal required, consequently the content of the vessel is 2 gallons and 5 pints.

Decimals equivalent to the fractional parts of a Pound. — See Tables of Metals, Weights and Measures, &c.

.03125	$\frac{1}{2}$ oz.	.28125	$4\frac{1}{2}$oz.	.53125	$8\frac{1}{2}$oz.	.78125	$12\frac{1}{2}$ oz.
.0625	1	.3125	5	.5625	9	.8125	13
.09375	$1\frac{1}{2}$	.34375	$5\frac{1}{2}$	.59375	$9\frac{1}{2}$	.84375	$13\frac{1}{2}$
.125	2	.375	6	.625	10	.875	14
.15625	$2\frac{1}{2}$	.40625	$6\frac{1}{2}$	.65625	$10\frac{1}{2}$	.90625	$14\frac{1}{2}$
.1875	3	.4375	7	.6875	11	.9375	15
.21875	$3\frac{1}{2}$	.46875	$7\frac{1}{2}$	.71875	$11\frac{1}{2}$	.96875	$15\frac{1}{2}$
.25	4	.5	8	.75	12	1.000	16

APPLICATION. Required the *weight* of one foot of Flat Bar Iron, 3-4 ths of an inch in thickness, and 1 7-8 ths inches breadth. Refer to the Table of Flat Bar Iron, and you will find the weight of 1 foot of the above dimensions, to be 4·696, that is, 4 pounds and 696 thousandth parts of a pound; and to ascertain this decimal in ounces, refer to the above Table for the decimal that is nearest, and you will find it to be ·6875, opposite to which is 11 ounces, the weight of the decimal required, consequently the weight of 1 foot length of the flat bar in question, will be 4 pounds 11 ounces.

APPLICATION. Required the *weight* of Tire Bar Iron, 1-2 an inch thick, and 1 5-8 ths of an inch broad, 16 feet long.

See Table of Bar Iron, where 1 foot length is 2·716 lbs., then

2·716 × 16 = 43·456, (*or 43 lbs. 7¼ oz. being the mean between* ·437 & ·468).

APPLICATION. Required the *weight* of 35 Bars, Round Iron, 1 1-4 inch diameter, 12 feet long, each.

See Table of Round Iron, where 1 foot in length is 4·09 lbs., then

4·09 × 12 × 35 = 1717·80 (*or* 1717 *lbs.* 13 *oz. being the nearest equivalent*).

APPLICATION. Required the *weight* of 64 Square Feet of Boiler Plate Iron, 3-16 ths of an inch thick. See Tables of weight and thickness of Plate Iron, Copper, Brass and Lead.

As 1 Square Foot weighs 7·5 lbs., then 7·5 × 64 = 480·0 lbs.

APPLICATION. Required the *weight* of 22 Square, or superficial, Feet of Sheet Iron, No. 9 Wire Guage thickness. See Tables Sheet Iron, Copper, and Brass, from No. 1 to No. 30 Wire Guage thickness.

As 1 square foot weighs 6·24 lbs., then

6·24 × 22 = 137·28 (137 lbs. 4½ oz.)

Decimals equivalent to the fractional parts of an Inch when divided into thirty-two parts; likewise the Decimals equivalent to the fractional parts of a Foot, of Linear Measures, — applicable to Mensuration, &c.

Decimals.	Parts of an Inch.	Decimals.	Parts of an Inch.	Decimals.	Parts of a Foot.
.03125	1-32	.53125	½ & 1-32	.01041	⅛
.0625	1-16	.5625	½ & 1-16	.02083	¼
.09375	3-32	.59375	½ & 3-32	.03125	⅜
.125	⅛	.625	⅝	.04166	½
.15625	⅛ & 1-32	.65625	⅝ & 1-32	.05208	⅝
.1875	⅛ & 1-16	.6875	⅝ & 1-16	.0625	¾
.21875	⅛ & 3-32	.71875	⅝ & 3-32	.07291	⅞
.25	¼	.75	¾	.0833	1
.28125	¼ & 1-32	.78125	¾ & 1-32	.1666	2
.3125	¼ & 1-16	.8125	¾ & 1-16	.25	3
.34375	¼ & 3-32	.84375	¾ & 3-32	.3333	4
.375	⅜	.875	⅞	.4166	5
.40625	⅜ & 1-32	.90625	⅞ & 1-32	.5	6
.4375	⅜ & 1-16	.9375	⅞ & 1-16	.5833	7
.46875	⅜ & 3-32	.96875	⅞ & 3-32	.6666	8
.5	½	1.000	1 inch.	.75	9
				.8333	10
				.9166	11

APPLICATION. 1. Required the number of Square Yards in a floor whose length is 13½, and breadth 9¾ feet.

13·5 × 9·75 = 131·625 ÷ 9 = 14·625 square yards.

2. Required the Area of a Fire Grate, under the boiler of a Steam Engine, whose length is 4 feet 7 inches, and width 3 feet 6 inches.

7 inches equal ·5833 and 6 inches equal ·5 (*see table*), then

4·5833 × 3·5 = 16·04155 square feet.

3. Required the Area of the side of a square piece of Board, 8 3-16 inches in length. 1-8 & 1-16 = 3-16 equal ·1875 (*see table*),

8·1875 × 8·1875 = 67·03515625 square inches.

4. Required the Cubic Contents in Inches of a Plate 30½ inches in length, 8 7-8 inches in breadth, and 5-8 inches thick.

30·50 × 8·875 = 270·68750 × ·625 = 169·17 + cubic inches.

5. — Required the Register Tonnage of a single decked vessel, length 101 feet and 9½ inches, breadth 26 feet 3 inches, and depth 9 feet 2 inches. Opposite 9 and ½ inch. is ·75 and ·04166, which added together equal ·79166:

Then, 101·79166 — 3·5 of 26·25 × 26·25 × 9·1666 ÷ 95 = 217·88·95ths tons.

* .8333

MULTIPLIERS FOR FACILITATING CALCULATIONS.

The product multiplied by the Decimals in the Table, is an approximation to the Capacity in Gallons, Weight in Pounds, Bushels, Square Feet, Cubic Feet, Miles, and Yards:

Lineal feet	multiplied by	.00019	equal	miles.
" yards	"	.000568	"	"
Square inches	"	.007	"	square feet.
" yards	"	.0002067	"	acres.
Circular inches	"	.00546	"	square feet.
Cylindrical inches	"	.0004546	"	cubic feet.
" feet	"	.02909	"	cubic yards.
Cubic inches	"	.00058	"	cubic feet.
" feet	"	.03704	"	cubic yards.
Cubic feet	"	7.477	"	United States gallons.
" inches	"	0.433	"	" " "
Cylindrical feet	"	5.868	"	" " "
" inches	"	.0034	"	" " "
Cubic feet	"	6.232	"	Imperial gallons.
" inches	"	.003607	"	" "
Cylindrical feet	"	4.895	"	" "
" inches	"	.002832	"	" "
Cubic feet	"	.80356	"	United States bushels.
" inches	"	.0465	"	" " "
" "	"	.779	"	Imperial "
Cylindrical feet	"	.6312	"	United States bushels.
" "	"	.61183	"	Imperial "
Cubic inches	"	.263	"	lbs. avs. of cast iron.
" "	"	.281	"	" wrought "
" "	"	.283	"	" steel.
" "	"	.3225	"	" copper.
" "	"	.3037	"	" brass.
" "	"	.26	"	" zinc.
" "	"	.4103	"	" lead.
" "	"	.2636	"	" tin.
" "	"	4908	"	" mercury.
" "	"	.0356	"	" ice.
" "	"	.036	"	" fresh water.
" "	"	.037	"	" salt water.
" "	"	.033	"	" oil.
Cylindrical inches	"	.2065	"	" cast iron.
" "	"	.2168	"	" wrought iron.
" "	"	.2223	"	" steel.
" "	"	.2533	"	" copper.
" "	"	.2385	"	" brass.
" "	"	.2042	"	" zinc.
" "	"	.3223	"	" lead.
" "	"	.207	"	" tin.
" "	"	.3854	"	" mercury.
" "	"	.283	"	" fresh water.
" "	"	.029	"	" salt water.
" "	"	.026	"	" oil.
Avoirdupois lbs.	"	.009	"	cwts.
" "	"	.00045	"	tons.

Example 1. — Required the number of Gallons contained in a Ship's Water Tank, whose interior diameter is 4½ feet, and depth 18 feet.

$$4.5 \times 4.5 \times 18 \times 5.868 = 2141.4 \text{ Gallons.}$$

Example 2. — Required the weight of a Cast Iron Cylinder whose diameter is 5 inches, and length 6 feet.

$$5 \times 5 \times 72 \times .2065 = 371.7 \text{ Pounds.}$$

Example 3. — Required the number of bushels in a bin, whose interior length is 10 feet, breadth 6 feet, and depth 4 feet.

$$10 \times 6 \times 4 \times .80356 = 192.8 \text{ Bushels.}$$

STANDARD WEIGHTS & MEASURES,

MENSURATION,

AND

LUMBER MEASURES.

EXPLANATION OF THE SIGNS USED IN THIS WORK.

$=$ *Equal to*, as 12 inches = 1 foot, or $6 \times 6 = 4 \times 9 = 36$.

$+$ *Plus*, or *more*, signifies addition; thus, $4 + 2$ denotes that 2 is to be added to 4.

$-$ *Minus*, or *less*, denotes subtraction; thus, $8 - 2 = 6$.

$\times$ *Multiplied by*, or *into*, signifies multiplication; as $7 \times 9 = 63$.

$\div$ *Divided by*, signifies division; as $117 \div 9 = 13$.

: :: : signifies *Proportion;* thus 4 : 6 :: 8 : 12; and is read, as 4 is to 6 so is 8 to 12.

$\surd$ indicates the *square root;* as $\surd 25 = 5$, because $5 \times 5 = 25$.

DECIMALS.

A *Decimal* Fraction is a fraction whose denominator is 10, or 100, or 1000, &c. The denominator of a decimal is never written; the numerator is written with a point (.) prefixed to it, and the denominator is understood to be a unit, with as many ciphers annexed as the numerator has places of figures. Thus,

.5 is $\frac{5}{10}$, .25 is $\frac{25}{100}$, .825 is $\frac{825}{1000}$.

Independent of the point (.) which distinguishes between integers and decimals, the fundamental rules of Addition, Subtraction, Multiplication and Division are the same as in simple arithmetic. Ciphers placed on the right of Decimals do not change their values; but placed on their left decrease their value tenfold; thus,

.1 is $\frac{1}{10}$, .01 is $\frac{1}{100}$, .001 is $\frac{1}{1000}$.

In *Adding* and *Subtracting* Decimals keep the points under each other.

In *Dividing* Decimals, point off in the *quotient* as many places for decimals as the decimal places in the *dividend* exceed those in the *divisor*; thus,

20.5) 20.500 (1.00

If there be not figures enough in the *quotient* to point off, prefix ciphers.

In *Multiplying* Decimals point off as many figures in the *product*, from the *right* hand, accounted as decimals, as there are decimals in the *multiplier* and *multiplicand* taken together; thus,

$15.32 \times 2.4 = 36.768$.

Reduce Decimals by multiplying them by the next lower denomination. [See Table of Decimals equivalent to the Fractional parts of a Gallon, Pound, Foot, and Inch.]

MEASURES OF CAPACITY AND WEIGHT.

MEASURES OF WEIGHT — *Avoirdupois:* — 16 drams equal 1 ounce; 16 ounces 1 pound; 112 pounds one hundred weight; 20 hundred weight 1 ton. — *Troy:* — 4 grains equal 1 carat; 24 grains 1 pennyweight; 20 pennyweights 1 ounce; 12 ounces 1 pound. — *Apothecaries:*— 20 grains equal 1 scruple (℈); 3 scruples 1 dram (ʒ); 8 drams 1 ounce (ʒ); 12 oz. 1 (℔) lb.

MEASURES OF SURFACE, OR SQUARE MEASURE.—144 square inches = 1 square foot; 9 square feet = 1 square yard; 30¼ square yards = 1 square rod, or pole; 40 square rods = 1 square rood; 4 square roods = 1 square acre. (or 43,560 feet;) 640 square acres = 1 square mile.

MEASURES OF CAPACITY (DRY.)—2150 42 cubic inches = 1 United States (or Winchester) bushel; the dimensions of which are 18½ inches diameter inside, 19½ inches outside, and 8 inches deep; 2747.70 cubic inches = 1 heaped bushel, the cone of which must not be less than 6 inches high. 2211.84 cubic inches = 1 New York statute bushel; 1 Imperial (British) bushel = 2218.192 cubic inches, and contains 80 lbs. of distilled water; the same in Ohio, 1 quarter of wheat = 8 bushels English, 8¼ U. States.

MEASURES OF LENGTH:— 16½ feet equal 1 rod or pole; 40 rods, 1 furlong; 8 furlongs, (or 5280 feet,) 1 mile; 60 geo. miles = 1 degree. — ROPES AND CABLES:—6 feet are equal to 1 fathom; 120 fathoms, to 1 cable's length.

FRENCH MEASURES OF FREQUENT REFERENCE, COMPARED WITH U. S. MEASURES.—Toise, 76·755; League, 2280 toises (common) 2000 (post); Fathom, 5 feet; Metre, 3·28 feet; Decimetre (1-10th metre), 3·94 inches; Velt, 2·00 gallons; Hectolitre, 26·42 do.; Decalitre, 2·64 do.; Litre, 2·11 pints; Kilolitre, 35 32 feet; Hectolitre, 2·84 bushels; Decalitre, 9·08 quarts; Millier, 2·205 pounds; Quintal, 220·54 do.; Kilogramme, 2·21 do.; 100 pounds 107·93 do.; 100 feet, 106·60 feet; Ton (of wine) 240 gallons.

Weight of a Bushel of various Articles.—1 Bushel of Potatoes, (common,) 60 pounds; 1 do. Potatoes, (sweet,) 56; 1 do. Corn, 56; 1 do. Hemp, 48, 1 do. Wheat. 60; 1 do. Barley 48; 1 do. Oats, 33; 1 do. Rye, 56; 1 do. Timothy Seed, 45; 1 do Beans, 60; 1 do. Pease, 60; 1 do Clover Seed, 60; 1 do. Buckwheat, 52; 1 do. Castor Oil Beans 60; 1 do Dried Apples, 22; 1 do. Dried Peaches, 33; 1 do. Blue Grass Seed, 14; 1 do. Red Top, 11. Many of the States regulate the weight of a bushel of various articles, by Statute; and in some cases it varies from the above. The weight of Seed also depends on the dryness of the article.

One Bushel of Bituminous Coal in the Western States = 2688 cubic inches = 76 pounds. Stone Coal, in Illinois, 80 lbs. to the bushel.

MEASURES OF CAPACITY (LIQUIDS.)— 231 cubic inches equal 1 United States standard gallon; 282 cubic inches = 1 ale gallon; 277·274 cubic inches = 1 Imperial (British) gallon, for dry, beer and wine; 31½ U. S. gallons = 1 barrel; 42 galls. = 1 tierce; 63 galls. = 1 hogshead; 84 galls. = 1 puncheon; 126 galls. = 1 pipe; 252 = 1 tun.

Gallons. The U. S. standard gallon contains 8·3389 avoirdupois pounds, or 58372.1754 troy grains of distilled water, at 39·83° Fahrenheit, the barometer at 30 inches; 1 gallon of ale weighs 10·5 lbs.; 1 Imperial (British) gallon weighs 10 lbs.; 1 gallon of Sperm Oil weighs 7¼ lbs.; 1 do. of Linseed 7¾ lbs.; 1 do. of Olive 7¼ lbs.; 1 do. of Whale 7 lbs. 11 ozs.; 1 do. of Proof Spirits 7 lbs. 15 ozs.; 1 do. Spirits of Turpentine 7 lbs. 5 ozs.

MEASURES OF SOLIDITY, OR CUBIC MEASURE.—1728 inches = 1 cubic foot; 27 cubic feet = 1 cubic yard; 40 cubic feet of round timber = 1 ton; 50 cubic feet of hewn timber = 1 ton; 16 cubic feet of wood = 1 foot of wood; 8 feet of wood (or 128 cubic feet,) = 1 cord; 1 chaldron of Newcastle coal = 5936 lbs.; 1 perch of stone = 24·75 cubic feet.

NUMBER OF CUBIC FEET IN A TON (2240 lbs.) OF VARIOUS BODIES:—Marble, 15·07; Granite, 16; Common Stone, 14·22; Paving Stone, 14·83; Sand, 23·5; Tallow, 38; English Oak, 37; American Oak, 41; Ash, 47; Elm, 64·5; Beech, 50·5; Teak, 48; Spanish Mahogany, 45; Honduras Do. 55; Maple, and Riga Fir, 47·8; Larch. 65·8; Pitch Pine, 53·6; Oil, 39; Proof Spirits, 38·6; Distilled Water, 35·6; Sea Water, 34·7; Grindstones, 17; Brick 17.

WEIGHT OF VARIOUS SUBSTANCES:—*lbs. Avoirdupois.*—1 *cubic foot* of bricks weighs 124 pounds; 1 do. of clay, 130; 1 do. of sand, or loose earth, 95; 1 do. of common soil, 124; 1 do. of cork, 15; 1 do. of clay and stones, 160; 1 do. of Marble, 171; 1 do. of Granite, 165, 1 do. of Cast Iron, 450·55; 1 do. of Wrought Iron, 486·65; 1 do. of Steel, 489·8; 1 do. Copper, 555; 1 do. Lead, 708·75; 1 do. Brass, 534·75; 1 do. Tin, 436; 1 do. White Pine, 29·56; 1 do, Pitch Pine, 41·8; 1 do. Red Pine, 41·5; 1 do. Elm, 34·9; 1 do. English Oak. 60·4; do do. 58·6; 1 do. Canadian, 54 8; 1 do. New England Fir, 34·9; 1 do. Sea Water, 64·3; 1 do. Fresh. 62·5.; 1 do. Air, ·07529; 1 do. Steam, ·03689.

Weight of a Cubic Inch in Pounds.— Of Lead ·410 lb.; Sheet Copper ·323 Sheet Brass ·304; Sheet Iron ·279; Cast Iron ·263; Cast Tin ·264; Cast; Zinc ·245; Platinum, rolled, ·797; do. wire, ·762: do. hammered, ·736; do. purified, ·705: do. crude, grains, ·566; Gold, hammered, ·701; do. pure cast, ·698; do. 20 carats fine, ·567; Silver, hammered, ·382; do. pure, ·378; Cast Steel, ·287; do. common soft, ·284; do. hard and tempered, ·282; Iron, bar, ·281; do. cast, ·261; do hammered, ·281.

EPITOME OF MENSURATION.

BOARD and PLANK are usually measured by the *square* or *superficial* foot of 144 inches. TON TIMBER is measured by the *cubic* foot of 1728 inches.

40 cubic feet of *round*, or 50 feet of *hewn* timber, equal 1 load, or ton.

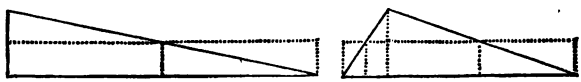
To find the number of square (or superficial) feet multiply the *length* in *inches* by the *breadth* in *inches*, and divide by 144. *But when all the dimensions are in feet, multiply the length in feet by the breadth in feet,—omitting the divisor.*

Example 1.—How many square feet are there in the *left hand* figure (suppose it a *Table*, *Slab of Marble*, *Brick Wall*, *Board*, *Plank*, &c.,) its length being 6 feet, and its breadth 6 feet? *Answer*, $6 \times 6 = 36$ *square feet.*

Example 2.—How many square feet are there in the *right hand* figure (supposing it a *Board*, *Table*, &c.,) its length being 4 feet and 5 inches, and its breadth (taken on the dotted line) 2 feet 3 inches.—[*When either of the dimensions are in feet and inches, both may be reduced to inches.*]

4 feet 5 inches = 53 inches $\times$ 27 $\div$ 144 = 9·9 *square feet.*
2 feet 3 inches = 27 inches.

TRIANGLE.—If the figure be a *triangle*, of whatever form, multiply the *perpendicular*, (the highest part,) by *one half* of the *base*, (the length.)



Example. — The extreme length (or base) of the left hand figure under this rule is 14 feet 7 inches; the breadth (or perpendicular) is 4 feet 2 inches. What is its area?

14 feet 7 inches = 175 inches $\div$ 2 = 87·5 $\times$ 50 $\div$ 144 = 30·3 *square feet.*
4 feet 2 inches = 50 inches.

LAND MEASURE.—How many square *feet* of *land* are there in a lot, which is laid out in a *right angled triangle* (represented by the left hand figure) the *base* measuring 49 feet, and the *perpendicular* 30 feet.

$49 \times 30 = 1470$ feet $\div 2 = 735$ *square feet.*

BOARD MEASURE.—BOARDS are measured by the *square* (or *superficial*) feet,—thus, *Multiply the length of the board in feet by the width in inches and divide the product by* 12.

Example 1.—How many *square* feet are there in a Board, or Plank, 18 feet long by 10 inches wide?

18 feet $\times$ 10 inches = 180 $\div$ 12 = 15 *square feet.*

RULE — When the *Board*, or *Plank*, tapers gradually add the width of the two ends together, and one half their sum multiplied by the length, will give the number of square feet.

Example 2.—How many square feet are there in a *Board* 18 *feet* long, 13 inches wide at one end and 17 inches at the other?—(Average breadth 15 inches.

18 feet $\times$ 15 inches = 270 $\div$ 12 = $22\frac{1}{2}$ square feet.

TIMBER and PLANK.— In measuring *timber* or *plank* which runs tapering, both in width and thickness, the *common rule* is, to add together the area of the two ends, and one half of the sum multiplied by the length and divided by 144, will give the solid contents. This rule is not exact, but it is sufficient where absolute accuracy is not required.

Example 1.—Required the solidity of a *tapering square stick of timber*, the largest end being 14 inches square, the lesser end 10 inches, and the length 40 feet. Answer,—Contents by the *common rule*, 41·11 cubic feet.

$$14 \times 14 = 196 + 100 \div 2 \times 40 \div 144 = 41{\cdot}11 \text{ cubic feet.}$$
$$10 \times 10 = 100.$$

Another method to find the Solidity of a Frustrum.

RULE.—To the product of the diameters of the two ends add the sum of their squares; multiply this sum by its height and by .2618; the product is the number of cubic inches, which divided by 231 gives the number of gallons.

Example.—Required the solid content, and gallons in a Coffee-pot, Pail, &c., whose height is 18 inches, diameter at the top 6 inches, and diameter at the bottom 9 inches.

$$\left.\begin{matrix} 6 \times 9 = 54 \\ 6^2 + 9^2 = 117 \end{matrix}\right\} = 171 \times 18 = 3078 \times {\cdot}2618 = 805{\cdot}82 \text{ inches.}$$

$$805\ 82 \div 231 = 3{\cdot}488 \text{ Gallons (or } 3\tfrac{7}{8} \text{ gallons).}$$

[See Table of Decimals equivalent to fractional parts of a Gallon].

ROUND TIMBER.—For round Timber add together the girth of the two ends and divide the sum by 2, for the mean girth; then square (*) ⅛ of this quotient, and multiply the product by the length, which gives the contents.

* [*The square of any number is that number multiplied by itself. Thus:* $2 \times 2 = 4$, = *the square of* 2; $4 \times 4 = 16$ *the square of* 4, *&c.*]

Example.—The mean girth of a tree being 5 feet 8 inches, and its length 18 feet, required its cubical contents.

5 ft. 8 inches = 68 inches $\div 4 = 17 \times 17 \times 216 \div 1728$ (*) = 36·125 cubic feet
18 feet = 216 inches.

* [*If the measurements are reduced to inches, divide by* 1728; *but if one of the measures is in feet, multiply the inches by feet, and divide the product by* 144.]

The above rule gives the customary, but the true content is found by squaring one fifth of the girth, and multiplying by twice the length.

Example.— The same as above, girth 5 feet 8 inches, length 18 feet.

$$\text{Girth} = 68 \div 5 = 13{\cdot}6 \times 13{\cdot}6 \times 36 \div 144 = 46{\cdot}24 \text{ cubic feet.}$$
$$18 \times 2 = 36 = \text{twice the length.}$$

CIRCLES. To find the area of a Circle multiply the square of the Diameter by the Decimal ·7854, and the Product will be the area.

Example. Required the area of a Circle whose diameter is 6 inches?

$$6 \times 6 = 36 \times {\cdot}7854 = 28{\cdot}274 \textit{ Square Inches.}$$

[Also, see table of "Areas of Circles."]

To find the circumference of a Circle from the diameter, multiply the diameter by 3·1416 the product is the circumference; and multiply the circumference by ·31831, and the product is the diameter.

In the formation of a Hoop or Ring of Wrought Iron, the following is the rule to determine the length of the Iron in an unbent state: — If it is the interior diameter of the hoop that is given, add the thickness of the iron; but if the exterior diameter, subtract from the given diameter the thickness of the iron, multiply the sum or remainder, by 3·1416, and the product is the length of the iron, in equal terms of unity.

Supposing the interior diameter of a hoop to be 32 inches, and the thickness of the iron 1¼, what must be the proper length of the iron, independent of any allowance for shutting?

$$32 + 1{\cdot}25 = 33{\cdot}25 \times 3{\cdot}1416 = 104{\cdot}458 \text{ inches.}$$

Again, let it be required to form a hoop of iron 7-8 inch in thickness, and 16½ inches outside diameter.

$$16{\cdot}5 - {\cdot}875 = 15{\cdot}625, \text{ or 1 foot 3 5-8 inches,}$$

independent of any allowance for shutting.

CYLINDERS.— To find the solidity of a cylinder, (a round stick of timber of uniform diameter, or a grindstone, &c.) multiply the area of the base, (as in the above example,) by the length, and the product will give the solid contents.

Example. Required the Solid Content of an Iron Roller, 2 feet 6 inches in diameter, and 12 feet in length?

2 ft. 6 in. = 30 in. × 30 × ·7854 × 12 ÷ 144 = 58·905 *Cubic Feet.*

WATER TANKS, CISTERNS, and OIL CANS, &c.— To find the capacity of any *Cylindrical Vessel*, find its interior cubic content in inches, by the foregoing rules; then, if its capacity be required in gallons divide by 231, (the number of cubic inches in a U. S. gallon.)

Example. — Required the number of gallons in a Can, whose diameter is 30 inches, and depth 50 inches?

$$30 \times 30 \times \cdot7854 \times 50 \div 231 = 153 \text{ gallons.}$$

Or, if the interior diameter of the Can is 2¼ feet, and its depth 2½ feet, then

$$2{\cdot}25 \times 2{\cdot}25 \times 2{\cdot}5 \times 5{\cdot}868 = 74\frac{1}{4} \text{ gallons.}$$

Or, if the diameter of a Tank is 62 inches, and its depth 100 inches, then

$$62 \times 62 \times 100 \times \cdot0034 = 1306{\cdot}96 \text{ gallons.}$$

Or, if the capacity of any vessel is required, from the size of a Gill to a Water Tank, &c., see the Table "Area of Circles".

CUBIC, OR SOLID MEASURE. To find the Cubical Content in a *Stick* of *Timber*, *Block* of *Stone*, *Box*, *Bin*, &c. If all the Dimensions are in Feet, multiply the Length by the Breadth, and this product by the Depth to obtain the number of Cubic Feet.

If the Length is in Feet and the width and depth in Inches, multiply the length by the width and this Product by the depth in inches,—then divide the last Product by 144 for the Cubic Feet. If all the Dimensions are in Feet and Inches reduce the whole to Inches, then multiply the Length, Breadth and Depth together, and divide the Product by 1728 to obtain the Cubic Feet.

Required the number of cubic feet in a *box*, *stone*, &c., 4½ feet long, 2½ feet wide and 2 feet deep?

$$4{\cdot}5 \times 2{\cdot}5 \times 2 = 22\frac{1}{2} \textit{ cubic feet.}$$

To find the capacity of a *bin*, *cistern*, *tanner's vat*, &c., find its (interior) cubic contents in *inches* by the preceding rules, then if the capacity be required in *gallons*, divide the whole number of inches by 231; — if in bushels, by 2150·42, — or, if in heaped bushels, by 2747·70.

Or, if the interior of a *coal bin* be 4 feet in length, 41 inches in breadth, and 32 inches in depth; then,

$4 \times 41 \times 32 \times \cdot00694 = 36\frac{1}{4}$ cubic feet, = 2000 lbs., or 1 ton of Beaver Meadow or Lehigh Coal.

1 Cubic Foot of Peach Mountain Coal, broken and screened for Stoves, weighs 54 pounds, and requires 37 cubic feet of space to stow one ton of 2000 pounds.

Coal is bought at wholesale at the rate of 2240 pounds to the ton, and sold at retail at the rate of 2000 pounds to the ton, *screened*.

Or, if the interior of a *crib* be 6½ feet in length, 3¾ feet in breadth, and 3½ feet in depth; then,

$$6{\cdot}5 \times 3{\cdot}75 \times 3{\cdot}25 \times \cdot80356 = 63{\cdot}6522 \text{ (or } 63\frac{1}{2} \text{ bushels and } \frac{1}{4} \text{ peck.)}$$

The Solid Contents of all bodies, which are of uniform bigness throughout, whatever may be the form of the ends is found by multiplying the area of one end into its height or length.

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144 inches equal (=) 1 square foot, (or, *area*.)
1728 inches equal (=) 1 cubic foot, (or, *solid contents*.)

READY RECKONER,

OR THE

MEASURER'S COMPLETE GUIDE.

BOARD, PLANK, SCANTLING, TIMBER, LOG TABLES, &c., &c.

For ascertaining (in an expeditious manner) the Number of SQUARE Feet in BOARDS, PLANKS, PAVEMENTS, PLASTERING, FLOORING, &c.—and the CUBICAL FEET, or SOLID Content, in TIMBER, TREES, HEWN TIMBER, STONE, BOXES, and PACKAGES, &c.

RULE.—In multiplying Decimals, point off as many *right* hand figures in the *product* as there are decimal figures in the *multiplicand*; the figures on the *left* hand give the number of feet, those on the *right* the decimal parts of a foot.—(See Examples.) Decimals signify *tenths*: thus, the decimal of a foot is the *tenth* part of a foot, the decimal of that *tenth* is the hundredth of a foot, and the decimal of that hundredth the thousandth. [See Table of Decimals equivalent to the Fractional parts of a Foot].

The last two figures of the Decimals, (when the length of the article consists of but a few feet) may be dropped, and the remaining figures only multiplied.

TABLE OF SUPERFICIAL, OR, FLAT MEASURE,

By which the Content in SUPERFICIAL FEET, *of Boards, Plank, Paving, &c., of any* LENGTH *and* BREADTH *can be obtained, by multiplying the decimal expressed in the table by the length of the board, &c.*

Breadth in inches.	Area of a lineal foot.	Breadth in inches.	Area of a lineal foot.	Breadth in inches.	Area of a lineal foot.	Breadth in inches.	Area of a lineal foot.
⅛	.0208	3⅛	.2708	6⅛	.5208	9⅛	.7708
¼	.0417	3¼	.2916	6¼	.5416	9¼	.7917
⅜	.0625	3⅜	.3125	6⅜	.5625	9⅜	.8125
1	.0834	4	.3334	7	.5833	10	.8334
1⅛	.1042	4⅛	.3542	7⅛	.6042	10⅛	.8542
1¼	.125	4¼	.375	7¼	.625	10¼	.875
1⅜	.1459	4⅜	.3958	7⅜	.6458	10⅜	.8959
2	.1667	5	.4167	8	.6667	11	.9167
2⅛	.1875	5⅛	.4375	8⅛	.6875	11⅛	.9375
2¼	.2084	5¼	.4583	8¼	.7084	11¼	.9583
2⅜	.2292	5⅜	.4792	8⅜	.7292	11⅜	.9792
3	.25	6	.5	9	.75	12	1.0000

Example 1. Required the number of square feet in a strip of board 10 feet long by 2 inches wide?

Opposite 2 is ·1667 which multiplied by (×) 10 equals (=) 1 foot 8 inches.

·1667 ...*Multiplicand*
10 ...*Multiplier.*
1·6670 ...*Product.*

Example 2. Required the number of square feet in a board or plank, 41 feet long by 24½ inches wide? Opposite ½ is ·0625, to which add 2 to the left of the decimal for feet (*when the width of the board exceeds 11¼ inches, add* 1 *to the left of the decimal for each foot*); *then* 2·0625 × 41 feet = 84 feet 7 inches.

2·0625
41
20625
82500
84·5625 *Ans.* 85 *feet.*

Example 3. The pavement of a side-walk is 40 feet long by 6 feet 6½ inches wide; required the number of square feet. Opposite 6½ is ·5416, to which add 6 for feet: *then*, 6·5416 × 40 = 261 feet 8 inches.

6·5416
40
261·6640 *Ans.* 262 *feet.*

Example 4. A room measures 16 feet by 15 feet 3½ inches, how many square feet of flooring does it contain. Opposite 3½ is ·2916, to which add 15 for feet; *then*, 15·2916 × 16 = 244 feet 8 inches.

If yards are required divide the *Product* by 9.

15·2916
16
917496
152916
244·6656 *Ans.* 245 *feet.*

Example 5. Required the number of square feet in a board 14 feet long 15 inches wide at one end and 9 at the other? (add together the width of the two ends and divide by 2 = 12 inches, mean width.) Opposite 12 is 1· × 14 = 14 feet.

1·
14
14· *Ans.* 14 *feet.*

It is customary, in measuring boards, &c., to count as nothing all fractions under 6 inches, and to count as one foot 6 inches and all fractions over.

ROUND AND EQUAL-SIDED TIMBER MEASURE.

Table for ascertaining the number of Cubical Feet, or Solid Contents, in a Stick of Round or Equal-sided Timber, Tree, &c.

¼ *Girt in Inches.*	*Area in Feet.*	¼ *Girt in Inches.*	*Area in Feet.*	¼ *Girt in Inches.*	*Area in Feet.*	¼ *Girt in Inches.*	*Area in Feet.*	¼ *Girt in Inches.*	*Area in Feet.*
6	·25	10¼	·803	15¼	1·668	20¼	2·898	25	4·34
6¼	·272	11	·84	15½	1·722	20½	2·917	25¼	4·428
6½	·294	11¼	·878	16	1·777	20¾	2·99	25½	4·516
6¾	·317	11½	·918	16¼	1·833	21	3·062	25¾	4·605
7	·34	11¾	·959	16½	1·89	21¼	3·136	26	4·694
7¼	·364	12	1·	16¾	1·948	21½	3·209	26¼	4·785
7½	·39	12¼	1·042	17	2·006	21¾	3·285	26½	4·876
7¾	·417	12½	1·085	17¼	2·066	22	3·362	26¾	4·969
8	·444	12¾	1·129	17½	2·126	22¼	3·438	27	5·062
8¼	·472	13	1·174	17¾	2·187	22½	3·516	27¼	5·158
8½	·501	13¼	1·219	18	2·25	22¾	3·598	27½	5·252
8¾	·531	13½	1·265	18¼	2·313	23	3·673	27¾	5·348
9	·562	13¾	1·313	18½	2·376	23¼	3·754	28	5·444
9¼	·594	14	1·361	18¾	2·442	23½	3·835	28¼	5.542
9½	·626	14¼	1·41	19	2·506	23¾	3·917	28½	5·64
9¾	·659	14½	1·46	19¼	2.574	24	4·	28¾	5·74
10	·694	14¾	1·511	19½	2·64	24¼	4·084	29	5·84
10¼	·73	15	1·562	19¾	2·709	24½	4·168	29¼	5·941
10½	·766	15¼	1·615	20	2·777	24¾	4·254	29½	6.044

RULE. Multiply the area in Feet, corresponding to the ¼ th *Girt*, by the length of the stick of Timber, and the *product* is the solidity in *feet* and *decimal parts of a foot.*

Example 1. A stick of Timber is 18 feet long and 56 inches girt, how many cubic feet does it contain? Opposite 14 is 1·361 which × 18 = 24 feet 6 inches.

1·361
18
10888
1361
24·498 *Ans.* 24½ *feet.*

RULE. — If a tree, or timber, is *tapering*, girt it about one-third of the way from the *butt* to the top; — or add together the area at the two ends, and divide the sum by 2, to obtain the mean girth; or take the girth of the tree at equal distances from each other, add all the girths together, and divide the sum by this number, for the mean girth.

It is usual to allow, on account of the bark, in oak 1-10th or 1-12th part of the circumference, beech, ash, &c., should be less.

TABLE, SHOWING THE SOLID CONTENTS IN TIMBER, BOXES, PACKAGES, &c.

Rule to find Solid (or Cubic) Feet.—If all the dimensions are in *Feet* multiply the *length* by the *width* and this *product* by the *depth*.—If all the Dimensions are in *feet* and *inches*, reduce the whole to inches, and multiply the *length*, *breadth* and *depth* together, and divide the product by 1728, to obtain cubic feet.

The *Width* and *Thickness* of the *Timber* or *Package* is given in the *top lines* of the Tables. The column on the left contains, first, the length in *feet*, and below the length in *inches*. If the length of the Timber or Package is in Feet and Inches, add the Feet and Inches together.

If a Timber or Package be of larger Thickness or Breadth than is contained in the Tables, add two numbers together, or double a number.

If the Length of the Timber is not contained in the Table, take twice some length, or add two lengths together. Suppose a Timber is 5 by 6 inches, and 22 feet long, take twice 11, and you have 4 feet 8 inches.

L'ng		5 *Inches* Thick *by*												6 *Inches* Thick *by*											
ft.	*in*	6	B	7	B	8	B	9	B	10	B	11	B	12	B	6	B	7	B	8	B	9	B	10	B	11	B	12	B
1	—	0	3	0	3	0	3	0	4	0	4	0	5	0	5	0	3	0	4	0	4	0	5	0	5	0	6	0	6
2	—	0	5	0	6	0	7	0	8	0	8	0	9	0	10	0	6	0	7	0	8	0	9	0	10	0	11	1	0
3	—	0	8	0	9	0	10	0	11	1	1	1	2	1	3	0	9	0	11	1	0	1	2	1	3	1	5	1	6
4	—	0	10	1	0	1	1	1	3	1	5	1	6	1	8	1	0	1	2	1	4	1	6	1	8	1	10	2	0
5	—	1	1	1	3	1	5	1	7	1	9	1	11	2	1	1	3	1	6	1	8	1	11	2	1	2	4	2	6
6	—	1	3	1	6	1	8	1	11	2	1	2	4	2	6	1	6	1	9	2	0	2	3	2	6	2	9	3	0
7	—	1	6	1	8	1	11	2	2	2	5	2	8	2	11	1	9	2	1	2	4	2	8	2	11	3	3	3	6
8	—	1	9	1	11	2	3	2	6	2	9	3	1	3	4	2	0	2	4	2	8	3	0	3	4	3	8	4	0
9	—	1	11	2	2	2	6	2	10	3	2	3	5	3	9	2	3	2	8	3	0	3	5	3	9	4	2	4	6
10	—	2	1	2	5	2	9	3	2	3	6	3	10	4	2	2	6	2	11	3	4	3	9	4	2	4	7	5	0
11	—	2	4	2	8	3	1	3	5	3	10	4	2	4	7	2	9	3	3	3	8	4	2	4	7	5	1	5	6
12	—	2	6	2	11	3	4	3	9	4	2	4	7	5	0	3	0	3	6	4	0	4	6	5	0	5	6	6	0
13	—	2	9	3	2	3	7	4	1	4	6	5	0	5	5	3	3	3	10	4	4	4	11	5	5	6	0	6	6
14	—	2	11	3	5	3	11	4	5	4	10	5	4	5	10	3	6	4	1	4	8	5	3	5	10	6	5	7	0
15	—	3	2	3	8	4	2	4	8	5	3	5	9	6	3	3	9	4	5	5	0	5	8	6	3	6	11	7	6
20	—	4	2	4	10	5	7	6	3	6	11	7	8	8	4	5	0	5	10	6	8	7	6	8	4	9	2	10	0
25	—	5	3	6	1	6	11	7	10	8	8	9	7	10	5	6	3	7	4	8	4	9	5	10	5	11	6	12	6
30	—	6	3	7	4	8	4	9	5	10	5	11	6	12	6	7	6	8	9	10	0	11	3	12	6	13	9	15	0
36	—	7	6	8	9	10	0	11	3	12	6	13	9	15	0	9	0	10	6	12	0	13	6	15	0	16	6	18	0
—	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
—	2	0	0	0	0	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
—	3	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	2
—	6	0	1	0	1	0	2	0	2	0	2	0	2	0	3	0	2	0	2	0	2	0	2	0	3	0	3	0	3

L'ng		7 *Inches* Thick *by*												8 *Inches* Thick *by*											
ft.	*in*	7	B	8	B	9	B	10	B	11	B	12	B	13	B	8	B	9	B	10	B	11	B	12	B	13	B	14	B
1	—	0	4	0	5	0	5	0	6	0	6	0	7	0	8	0	5	0	6	0	7	0	7	0	8	0	9	0	9
2	—	0	8	0	9	0	11	1	0	1	1	1	2	1	3	0	11	1	0	1	1	1	3	1	4	1	5	1	7
3	—	1	0	1	2	1	4	1	6	1	7	1	9	1	11	1	4	1	6	1	8	1	10	2	0	2	2	2	4
4	—	1	4	1	7	1	9	1	11	2	2	2	4	2	6	1	9	2	0	2	3	2	5	2	8	2	11	3	1
5	—	1	8	1	11	2	2	2	5	2	8	2	11	3	2	2	3	2	6	2	9	3	1	3	4	3	7	3	11
6	—	2	1	2	4	2	8	2	11	3	3	3	6	3	10	2	8	3	0	3	4	3	8	4	0	4	4	4	8
7	—	2	5	2	9	3	1	3	5	3	9	4	1	4	5	3	1	3	6	3	11	4	3	4	8	5	1	5	5
8	—	2	9	3	1	3	6	3	11	4	3	4	8	5	1	3	7	4	0	4	5	4	11	5	4	5	9	6	3
9	—	3	1	3	6	3	11	4	5	4	10	5	3	5	8	4	0	4	6	5	0	5	6	6	0	6	6	7	0
10	—	3	5	3	11	4	5	4	10	5	4	5	10	6	4	4	5	5	0	5	7	6	1	6	8	7	3	7	9
11	—	3	9	4	3	4	10	5	4	5	11	6	5	6	11	4	11	5	6	6	1	6	9	7	4	7	11	8	7
12	—	4	1	4	8	5	3	5	10	6	5	7	0	7	7	5	4	6	0	6	8	7	4	8	0	8	8	9	4
13	—	4	5	5	1	5	8	6	4	6	11	7	7	8	3	5	9	6	6	7	3	7	11	8	8	9	5	10	1
14	—	4	9	5	5	6	2	6	10	7	6	8	2	8	10	6	3	7	0	7	9	8	7	9	4	10	1	10	11
15	—	5	1	5	10	6	7	7	4	8	0	8	9	9	6	6	8	7	6	8	4	9	2	10	0	10	10	11	8
20	—	6	10	7	9	8	9	9	9	10	8	11	8	12	8	8	11	10	0	11	1	12	3	13	4	14	5	15	7
25	—	8	6	9	9	10	11	12	2	13	4	14	7	15	10	11	1	12	6	13	11	15	3	16	8	18	1	19	5
30	—	10	3	11	8	13	2	14	7	16	1	17	6	19	0	13	4	15	0	16	8	18	4	20	0	21	8	23	4
36	—	12	3	14	0	15	9	17	6	19	3	21	0	22	9	16	0	18	0	20	0	22	0	24	0	26	0	28	0
—	1	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	0	0	1	0	1	0	1	0	1	0	1	0	1
—	2	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	2
—	3	0	1	0	1	0	1	0	2	0	2	0	2	0	2	0	1	0	2	0	2	0	2	0	2	0	2	0	2
—	6	0	2	0	2	0	3	0	3	0	3	0	4	0	4	0	3	0	3	0	3	0	4	0	4	0	4	0	5

If a Timber be LONGER than is contained in the Tables, take twice some LENGTH, or add two LENGTHS together. If the Timber is 26 feet long, add the feet opposite 20 and 6 together.

L'ng	9 *Inches* Thick *by*																10 *Inches* Thick *by*															
ft. *in*	9	B	10	B	11	B	12	B	13	B	14	B	15	B			10	B	11	B	12	B	13	B	14	B	15	B	16	B		
1 —	0	7	0	8	0	8	0	9	0	10	0	11	0	11			0	8	0	9	0	10	0	11	1	0	1	1	1	1		
2 —	1	2	1	3	1	5	1	6	1	8	1	9	1	11			1	5	1	6	1	8	1	10	1	11	2	1	2	3		
3 —	1	8	1	11	2	1	2	3	2	5	2	8	2	10			2	1	2	4	2	6	2	9	2	11	3	2	3	4		
4 —	2	3	2	6	2	9	3	0	3	3	3	6	3	9			2	9	3	1	3	4	3	7	3	11	4	2	4	5		
5 —	2	10	3	2	3	5	3	9	4	1	4	5	4	8			3	6	3	10	4	2	4	6	4	10	5	3	5	7		
6 —	3	5	3	9	4	2	4	6	4	11	5	3	5	8			4	2	4	7	5	0	5	5	5	10	6	3	6	8		
7 —	3	11	4	5	4	10	5	3	5	8	6	2	6	7			4	10	5	4	5	10	6	4	6	10	7	4	7	9		
8 —	4	6	5	0	5	6	6	0	6	6	7	0	7	6			5	7	6	1	6	8	7	3	7	9	8	4	8	11		
9 —	5	1	5	8	6	2	6	9	7	4	7	11	8	5			6	3	6	11	7	6	8	2	8	9	9	5	10	0		
10 —	5	8	6	3	6	11	7	6	8	2	8	9	9	5			6	11	7	8	8	4	9	0	9	9	10	5	11	1		
15 —	8	5	9	5	10	4	11	3	12	2	13	2	14	1			10	5	11	6	12	6	13	7	14	7	15	8	16	8		
20 —	11	3	12	6	13	9	15	0	16	3	17	6	18	9			13	11	15	3	16	8	18	1	19	5	20	10	22	3		
25 —	14	1	15	8	17	2	18	9	20	4	21	11	23	5			17	4	19	1	20	10	22	7	24	4	26	1	27	9		
30 —	16	11	18	9	20	8	22	6	24	5	26	3	28	2			20	10	22	11	25	0	27	1	29	2	31	3	33	4		
36 —	20	3	22	6	24	9	27	0	29	3	31	6	33	9			25	0	27	6	30	0	32	6	35	0	37	6	40	0		
— 1	0	1	0	1	0	1	0	1	0	1	0	1	0	1			0	1	0	1	0	1	0	1	0	1	0	1	0	1		
— 2	0	1	0	1	0	1	0	2	0	2	0	2	0	2			0	1	0	2	0	2	0	2	0	2	0	2	0	2		
— 3	0	2	0	2	0	2	0	2	0	2	0	3	0	3			0	2	0	2	0	3	0	3	0	3	0	3	0	3		
— 6	0	3	0	4	0	4	0	5	0	5	0	5	0	6			0	4	0	5	0	5	0	5	0	6	0	6	0	7		

L'ng	11 *Inches* Thick *by*																12 *Inches* Thick *by*															
ft. *in*	11	B	12	B	13	B	14	B	15	B	16	B	17	B			12	B	13	B	14	B	15	B	16	B	17	B	18	B		
1 —	0	10	0	11	1	0	1	1	1	2	1	3	1	4			1	0	1	1	1	6	1	3	1	8	1	5	1	6		
2 —	1	8	1	10	2	0	2	2	2	4	2	5	2	7			2	0	2	2	2	8	2	6	2	0	2	10	3	0		
3 —	2	6	2	9	3	0	3	3	3	5	3	8	3	11			3	0	3	3	3	2	3	9	4	4	4	3	4	6		
4 —	3	4	3	8	4	0	4	3	4	7	4	11	5	2			4	0	4	4	4	4	5	0	5	8	5	8	6	0		
5 —	4	2	4	7	5	0	5	4	5	9	6	1	6	6			5	0	5	5	5	10	6	3	6	0	7	1	7	6		
6 —	5	1	5	6	6	0	6	5	6	11	7	4	7	10			6	0	6	6	7	0	7	6	8	4	8	6	9	0		
7 —	5	11	6	5	6	11	7	6	8	0	8	7	9	1			7	0	7	7	8	2	8	9	9	8	9	11	10	6		
8 —	6	9	7	4	7	11	8	7	9	2	9	9	10	5			8	0	8	8	9	4	10	0	10	0	11	4	12	0		
9 —	7	7	8	3	8	11	9	8	10	4	11	0	11	8			9	0	9	9	10	6	11	3	12	4	12	9	13	6		
10 —	8	5	9	2	9	11	10	8	11	6	12	3	13	0			10	0	10	10	11	8	12	6	13	0	14	2	15	0		
15 —	12	7	13	9	14	11	16	1	17	2	18	4	19	6			15	0	16	3	17	6	18	9	20	0	21	3	22	6		
20 —	16	10	18	4	19	10	21	5	22	11	24	5	26	0			20	0	21	8	23	4	25	0	26	4	28	4	30	0		
25 —	21	0	22	11	24	10	26	9	28	8	30	7	32	6			25	0	27	1	29	2	31	3	33	0	35	5	37	6		
30 —	25	3	27	6	29	10	32	1	34	5	36	8	39	0			30	0	32	6	35	0	37	6	40	0	42	6	45	0		
36 —	30	3	33	0	35	9	38	6	41	3	44	0	46	9			36	0	39	0	42	0	45	0	48	1	51	0	54	0		
— 1	0	1	0	1	0	1	0	1	0	1	0	1	0	1			0	1	0	1	0	1	0	1	0	3	0	1	0	2		
— 2	0	2	0	2	0	2	0	2	0	2	0	2	0	3			0	2	0	2	0	2	0	3	0	4	0	3	0	3		
— 3	0	3	0	3	0	3	0	3	0	3	0	4	0	4			0	3	0	3	0	4	0	4	0	4	0	4	0	5		
— 6	0	5	0	6	0	6	0	6	0	7	0	7	0	8			0	6	0	7	0	7	0	8	0	8	0	9	0	9		

L'ng	13 *Inches* Thick *by*																14 *Inches* Thick *by*															
ft. *in*	13	B	14	B	15	B	16	B	17	B	18	B	19	B			14	B	15	B	16	B	17	B	18	B	19	B	20	B		
1 —	1	2	1	3	1	4	1	5	1	6	1	8	1	9			1	4	1	6	1	7	1	8	1	9	1	10	1	11		
2 —	2	4	2	6	2	9	2	11	3	1	3	3	3	5			2	9	2	11	3	1	3	4	3	6	3	8	3	11		
3 —	3	6	3	10	4	1	4	4	4	7	4	11	5	2			4	1	4	5	4	8	5	0	5	3	5	7	5	10		
4 —	4	8	5	1	5	5	5	9	6	2	6	6	6	10			5	5	5	10	6	3	6	7	7	0	7	5	7	9		
5 —	5	10	6	4	6	9	7	3	7	8	8	2	8	7			6	10	7	4	7	9	8	3	8	9	9	3	9	9		
6 —	7	1	7	7	8	2	8	8	9	3	9	9	10	4			8	2	8	9	9	4	9	11	10	6	11	1	11	8		
7 —	8	3	8	10	9	6	10	1	10	9	11	5	12	0			9	6	10	3	10	11	11	7	12	3	12	13	12	13		
8 —	9	5	10	1	10	10	11	7	12	3	13	0	13	9			10	11	11	8	12	5	13	3	14	0	14	9	15	7		
9 —	10	7	11	5	12	2	13	0	13	10	14	8	15	5			12	3	13	2	14	0	14	11	15	9	16	8	17	6		
10 —	11	9	12	8	13	7	14	5	15	4	16	3	17	2			13	7	14	7	15	7	16	6	17	6	18	6	19	5		
15 —	17	7	19	0	20	4	21	8	23	0	24	5	25	9			20	5	21	11	23	4	24	10	26	3	27	9	29	2		
20 —	23	6	25	3	27	1	28	11	30	8	32	6	34	4			27	3	29	2	31	1	33	1	35	0	36	11	38	11		
25 —	29	4	31	7	33	10	36	1	38	4	40	8	42	11			34	0	36	6	38	11	41	4	43	9	46	2	48	7		
30 —	35	3	37	11	40	8	43	4	46	1	48	9	51	6			40	10	43	9	46	8	49	7	52	6	55	5	58	4		
36 —	42	3	45	6	48	9	52	0	55	3	58	6	61	9			49	0	52	6	56	0	59	6	63	0	66	6	70	0		
— 1	0	1	0	1	0	1	0	1	0	2	0	2	0	2			0	1	0	1	0	2	0	2	0	2	0	2	0	2		
— 2	0	2	0	3	0	3	0	3	0	3	0	3	0	3			0	3	0	3	0	3	0	3	0	4	0	4	0	4		
— 3	0	4	0	4	0	4	0	4	0	5	0	5	0	5			0	4	0	4	0	5	0	5	0	5	0	6	0	6		
— 6	0	7	0	8	0	8	0	9	0	9	0	10	0	10			0	8	0	9	0	9	0	10	0	11	0	11	1	0		

Suppose a Package 9 feet, long 4 feet broad and 20 inches thick? opposite 9 and under 24 inches we find 30, which doubled gives 60 feet,— the answer. If the Timber or Package is of larger breadth or thickness than is contained in the Table, add two numbers together.

L'ng	15 *Inches* Thick *by*												16 *Inches* Thick *by*											
ft. in	15	B	16	B	17	B	18	B	19	B	20	B	21	B	16	B	17	B	18	B	19	B	20	B	21	B	22	B
1	1	7	1	8	1	9	1	11	2	0	2	1	2	2	1	9	1	11	2	0	2	1	2	3	2	2	2	5
2	3	2	3	4	3	7	3	9	4	0	4	2	4	5	3	7	3	9	4	0	4	3	4	5	4	4	4	11
3	4	8	5	0	5	4	5	8	5	11	6	3	6	7	5	4	5	8	6	0	6	4	6	8	7	8	7	4
4	6	3	6	8	7	1	7	6	7	11	8	4	8	9	7	1	7	7	8	0	8	5	8	11	9	0	9	9
5	7	10	8	4	8	10	9	5	9	11	10	5	10	11	8	11	9	5	10	0	10	7	11	1	11	4	12	3
6	9	5	10	0	10	8	11	3	11	11	12	6	13	2	10	8	11	4	12	0	12	8	13	4	14	8	14	8
7	10	11	11	8	12	5	13	2	13	10	14	7	15	4	12	5	13	3	14	0	14	9	15	7	16	0	17	1
8	12	6	13	4	14	2	15	0	15	10	16	8	17	6	14	3	15	1	16	0	16	11	17	9	18	4	19	7
9	14	1	15	0	15	11	16	11	17	10	18	9	19	8	16	0	17	0	18	0	19	0	20	0	21	8	22	0
10	15	8	16	8	17	9	18	9	19	10	20	10	21	11	17	9	18	11	20	0	21	1	22	3	23	0	24	5
15	23	5	25	0	26	7	28	2	29	8	31	3	32	10	26	8	28	4	30	0	31	8	33	4	35	4	36	8
20	31	3	33	4	35	5	37	6	39	7	41	8	43	9	35	7	37	9	40	0	42	3	44	5	46	0	48	11
25	39	1	41	8	44	3	46	11	49	6	52	1	54	8	44	5	47	3	50	0	52	9	55	7	58	8	61	1
30	46	11	50	0	53	2	56	3	59	5	62	6	65	8	53	4	56	8	60	0	63	4	66	8	70	4	73	4
36	56	3	60	0	63	9	67	6	71	3	75	0	78	9	64	0	68	0	72	0	76	0	80	0	84	0	88	0
1	1	0	2	0	2	0	2	0	2	0	2	0	2	0	2	0	2	0	2	0	2	0	2	0	2	0	0	0	2
2	2	0	3	0	3	0	4	0	4	0	4	0	4	0	4	0	4	0	4	0	4	0	4	0	4	0	2	0	5
3	3	0	5	0	5	0	6	0	6	0	6	0	7	0	5	0	6	0	6	0	6	0	7	0	5	0	7	0	7
6	9	0	10	0	11	0	11	1	0	1	1	1	1	1	11	0	11	1	0	1	1	1	1	1	7	1	3		

L'ng	17 *Inches* Thick *by*												18 *Inches* Thick *by*											
ft. in	17	B	18	B	19	B	20	B	21	B	22	B	23	B	18	B	19	B	20	B	21	B	22	B	23	B
1	2	0	2	2	2	3	2	4	2	6	2	7	2	9	2	3	2	5	2	6	2	8	2	9	2	11
2	4	0	4	3	4	6	4	9	5	0	5	2	5	5	4	6	4	9	5	0	5	3	5	6	5	9
3	6	0	6	5	6	9	7	1	7	5	7	10	8	2	6	9	7	2	7	6	7	11	8	3	8	8
4	8	0	8	6	9	0	9	5	9	11	10	5	10	10	9	0	9	6	10	0	10	6	11	0	11	6
5	10	0	10	8	11	3	11	10	12	5	13	0	13	7	11	3	11	11	12	6	13	2	13	9	14	5
6	12	1	12	9	13	6	14	2	14	11	15	7	16	4	13	6	14	3	15	0	15	9	16	6	17	8
7	14	1	14	11	15	8	16	6	17	4	18	2	19	0	15	9	16	8	17	6	18	5	19	3	20	2
8	16	1	17	0	17	11	18	11	19	10	20	9	21	9	18	0	19	0	20	0	21	0	22	0	23	0
9	18	1	19	2	20	2	21	3	22	4	23	5	24	5	20	3	21	5	22	6	23	8	24	9	25	11
10	20	1	21	3	22	5	23	7	24	10	26	0	27	2	22	6	23	9	25	0	26	3	27	6	28	9
15	30	1	31	11	33	8	35	5	37	2	39	0	40	9	33	9	35	8	37	6	39	5	41	3	43	2
20	40	2	42	6	44	10	47	3	49	7	51	11	54	4	45	0	47	6	50	0	52	6	55	0	57	6
25	50	2	53	2	56	1	59	0	62	0	64	11	67	11	56	3	59	5	62	6	65	8	68	9	71	11
30	60	3	63	9	67	4	70	10	74	5	77	11	81	6	67	6	71	3	75	0	78	9	82	6	86	3
36	72	8	76	6	80	9	85	0	89	3	93	6	97	9	81	0	85	6	90	0	94	6	99	0	103	6
1	1	0	2	0	2	0	2	0	2	0	2	0	3	0	3	0	2	0	2	0	3	0	3	0	3	0	3	
2	2	0	4	0	4	0	4	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	6	0	6	
3	3	0	6	0	6	0	7	0	7	0	7	0	8	0	8	0	7	0	7	0	8	0	8	0	8	0	9	
6	1	0	1	1	1	1	1	2	1	3	1	4	1	4	1	2	1	2	1	3	1	4	1	5	1	5		

L'ng	19 *Inches* Thick *by*												20 *Inches* Thick *by*											
ft. in	19	B	20	B	21	B	22	B	23	B	24	B	20	B	21	B	22	B	23	B	24	B	25	B
1	2	6	2	8	2	9	2	11	3	0	3	2	2	9	2	11	3	1	3	2	3	4	3	6
2	5	0	5	3	5	7	5	10	6	1	6	4	5	7	5	10	6	1	6	5	6	8	6	11
3	7	6	7	11	8	4	8	9	9	1	9	6	8	4	8	9	9	2	9	7	10	0	10	5
4	10	0	10	7	11	1	11	7	12	2	12	8	11	1	11	8	12	3	12	9	13	4	13	11
5	12	6	13	2	13	10	14	6	15	2	15	10	13	11	14	7	15	3	16	0	16	8	17	4
6	15	1	15	10	16	8	17	5	18	3	19	0	16	8	17	6	18	4	19	2	20	0	20	10
7	17	7	18	6	19	5	20	4	21	3	22	2	19	5	20	5	21	5	22	4	23	4	24	4
8	20	1	21	1	22	2	23	3	24	3	25	4	22	3	23	4	24	5	25	7	26	8	27	9
9	22	7	23	9	24	11	26	2	27	4	28	6	25	0	26	3	27	6	28	9	30	0	31	3
10	25	1	26	5	27	9	29	0	30	4	31	8	27	9	29	2	30	7	31	11	33	4	34	9
15	37	7	39	7	41	7	43	7	45	6	47	6	41	8	43	9	45	10	47	11	50	0	52	1
20	50	2	52	9	55	5	58	1	60	8	63	4	55	7	58	4	61	1	63	11	66	8	69	5
25	62	8	66	0	69	3	72	7	75	10	79	2	69	5	72	11	76	5	79	10	83	4	86	10
30	75	3	79	2	83	2	87	1	91	1	95	0	83	4	87	6	91	8	95	10	100	0	104	2
36	90	3	95	0	99	9	104	6	109	3	114	0	100	0	105	0	110	0	15	0	120	0	125	0
1	1	0	3	0	3	0	3	0	3	0	3	0	3	0	3	0	3	0	3	0	3	0	3	0
2	2	0	5	0	5	0	6	0	6	0	6	0	6	0	6	0	6	0	6	0	6	0	7	0
3	3	0	8	0	8	0	8	0	9	0	9	0	10	0	8	0	9	0	9	0	10	0	10	0
6	1	3	1	4	1	5	1	5	1	6	1	7			1	5	1	6	1	6	1	7	1	8

If a Timber be LONGER than is contained in the Tables, take twice some LENGTH, or add two LENGTHS together. If the Timber is 26 feet long, add the feet opposite 20 and 6 together.

L'ng	9 *Inches* Thick *by*												10 *Inches* Thick *by*											
ft. in	9	B	10	B	11	B	12	B	13	B	14	B	15	B	10	B	11	B	12	B	13	B	14	B	15	B	16	B
1	0	7	0	8	0	8	0	9	0	10	0	11	0	11	0	8	0	9	0	10	0	11	1	0	1	1	1	1
2	1	2	1	3	1	5	1	6	1	8	1	9	1	11	1	5	1	6	1	8	1	10	1	11	2	1	2	3
3	1	8	1	11	2	1	2	3	2	5	2	8	2	10	2	1	2	4	2	6	2	9	2	11	3	2	3	4
4	2	3	2	6	2	9	3	0	3	3	3	6	3	9	2	9	3	1	3	4	3	7	3	11	4	2	4	5
5	2	10	3	2	3	5	3	9	4	1	4	5	4	8	3	6	3	10	4	2	4	6	4	10	5	3	5	7
6	3	5	3	9	4	2	4	6	4	11	5	3	5	8	4	2	4	7	5	0	5	5	5	10	6	3	6	8
7	3	11	4	5	4	10	5	3	5	8	6	2	6	7	4	10	5	4	5	10	6	4	6	10	7	4	7	9
8	4	6	5	0	5	6	6	0	6	6	7	0	7	6	5	7	6	1	6	8	7	3	7	9	8	4	8	11
9	5	1	5	8	6	2	6	9	7	4	7	11	8	5	6	3	6	11	7	6	8	2	8	9	9	5	10	0
10	5	8	6	3	6	11	7	6	8	2	8	9	9	5	6	11	7	8	8	4	9	0	9	9	10	5	11	1
15	8	5	9	5	10	4	11	3	12	2	13	2	14	1	10	5	11	6	12	6	13	7	14	7	15	8	16	8
20	11	3	12	6	13	9	15	0	16	3	17	6	18	9	13	11	15	3	16	8	18	1	19	5	20	10	22	3
25	14	1	15	8	17	2	18	9	20	4	21	11	23	5	17	4	19	1	20	10	22	7	24	4	26	1	27	9
30	16	11	18	9	20	8	22	6	24	5	26	3	28	2	20	10	22	11	25	0	27	1	29	2	31	3	33	4
36	20	3	22	6	24	9	27	0	29	3	31	6	33	9	25	0	27	6	30	0	32	6	35	0	37	6	40	0
1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
2	0	1	0	1	0	1	0	2	0	2	0	2	0	2	0	1	0	2	0	2	0	2	0	2	0	2	0	2
3	0	2	0	2	0	2	0	2	0	2	0	3	0	3	0	2	0	2	0	3	0	3	0	3	0	3	0	3
6	0	3	0	4	0	4	0	5	0	5	0	5	0	6	0	4	0	5	0	5	0	5	0	6	0	6	0	7

L'ng	11 *Inches* Thick *by*												12 *Inches* Thick *by*											
ft. in	11	B	12	B	13	B	14	B	15	B	16	B	17	B	12	B	13	B	14	B	15	B	16	B	17	B	18	B
1	0	10	0	11	1	0	1	1	1	2	1	3	1	4	1	0	1	1	1	6	1	3	1	8	1	5	1	6
2	1	8	1	10	2	0	2	2	2	4	2	5	2	7	2	0	2	2	2	8	2	6	2	0	2	10	3	0
3	2	6	2	9	3	0	3	3	3	5	3	8	3	11	3	0	3	3	3	2	3	9	4	4	4	3	4	6
4	3	4	3	8	4	0	4	3	4	7	4	11	5	2	4	0	4	4	4	4	5	0	5	8	5	8	6	0
5	4	2	4	7	5	0	5	4	5	9	6	1	6	6	5	0	5	5	5	10	6	3	6	0	7	1	7	6
6	5	1	5	6	6	0	6	5	6	11	7	4	7	10	6	0	6	6	7	0	7	6	8	4	8	6	9	0
7	5	11	6	5	6	11	7	6	8	0	8	7	9	1	7	0	7	7	8	2	8	9	9	8	9	11	10	6
8	6	9	7	4	7	11	8	7	9	2	9	9	10	5	8	0	8	8	9	4	10	0	10	0	11	4	12	0
9	7	7	8	3	8	11	9	8	10	4	11	0	11	8	9	0	9	9	10	6	11	3	12	4	12	9	13	6
10	8	5	9	2	9	11	10	8	11	6	12	3	13	0	10	0	10	10	11	8	12	6	13	0	14	2	15	0
15	12	7	13	9	14	11	16	1	17	2	18	4	19	6	15	0	16	3	17	6	18	9	20	8	21	3	22	6
20	16	10	18	4	19	10	21	5	22	11	24	5	26	0	20	0	21	8	23	4	25	0	26	4	28	4	30	0
25	21	0	22	11	24	10	26	9	28	8	30	7	32	6	25	0	27	1	29	2	31	3	33	0	35	5	37	6
30	25	3	27	6	29	10	32	1	34	5	36	8	39	0	30	0	32	6	35	0	37	6	40	0	43	6	45	0
36	30	8	33	0	35	9	38	6	41	3	44	0	46	9	36	0	39	0	42	0	45	0	48	1	51	0	54	0
1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	3	0	1	0	2
2	0	2	0	2	0	2	0	2	0	2	0	2	0	3	0	2	0	2	0	2	0	3	0	4	0	3	0	3
3	0	3	0	3	0	3	0	3	0	3	0	4	0	4	0	3	0	3	0	4	0	4	0	4	0	4	0	5
6	0	5	0	6	0	6	0	6	0	7	0	7	0	8	0	6	0	7	0	7	0	8	0	8	0	9	0	9

L'ng	13 *Inches* Thick *by*														14 *Inches* Thick *by*													
ft. in	13	B	14	B	15	B	16	B	17	B	18	B	19	B	14	B	15	B	16	B	17	B	18	B	19	B	20	B
1	1	2	1	3	1	4	1	5	1	6	1	8	1	9	1	4	1	6	1	7	1	8	1	9	1	10	1	11
2	2	4	2	6	2	9	2	11	3	1	3	3	3	5	2	9	2	11	3	1	3	4	3	6	3	8	3	11
3	3	6	3	10	4	1	4	4	4	7	4	11	5	2	4	1	4	5	4	8	5	0	5	3	5	7	5	10
4	4	8	5	1	5	5	5	9	6	2	6	6	6	10	5	5	5	10	6	3	6	7	7	0	7	5	7	9
5	5	10	6	4	6	9	7	3	7	8	8	2	8	7	6	10	7	4	7	9	8	3	8	9	9	3	9	9
6	7	1	7	7	8	2	8	8	9	3	9	9	10	4	8	2	8	9	9	4	9	11	10	6	11	1	11	8
7	8	3	8	10	9	6	10	1	10	9	11	5	12	0	9	6	10	3	10	11	11	7	12	3	12	11	13	7
8	9	5	10	1	10	10	11	7	12	3	13	0	13	9	10	11	11	8	12	5	13	3	14	0	14	9	15	7
9	10	7	11	5	12	2	13	0	13	10	14	8	15	5	12	3	13	2	14	0	14	11	15	9	16	8	17	6
10	11	9	12	8	13	7	14	5	15	4	16	3	17	2	13	7	14	7	15	7	16	6	17	6	18	6	19	5
15	17	7	19	0	20	4	21	8	23	0	24	5	25	9	20	5	21	11	23	4	24	10	26	3	27	9	29	2
20	23	6	25	3	27	1	28	11	30	8	32	6	34	4	27	3	29	2	31	1	33	1	35	0	36	11	38	11
25	29	4	31	7	33	10	36	1	38	4	40	8	42	11	34	0	36	6	38	11	41	4	43	9	46	2	48	7
30	35	3	37	11	40	8	43	4	46	1	48	9	51	6	40	10	43	9	46	8	49	7	52	6	55	5	58	4
36	42	3	45	6	48	9	52	0	55	3	58	6	61	9	49	0	52	6	56	0	59	6	63	0	66	6	70	0
1	0	1	0	1	0	1	0	1	0	2	0	2	0	2	0	1	0	1	0	2	0	2	0	2	0	2	0	2
2	0	2	0	3	0	3	0	3	0	3	0	3	0	3	0	3	0	3	0	3	0	4	0	4	0	4	0	4
3	0	4	0	4	0	4	0	4	0	5	0	5	0	5	0	4	0	4	0	5	0	5	0	5	0	6	0	6
6	0	7	0	8	0	8	0	9	0	9	0	10	0	10	0	8	0	9	0	9	0	10	0	11	0	11	1	0

Suppose a Package 9 feet, long 4 feet broad and 20 inches thick? opposite 9 and under 24 inches we find 30, which doubled gives 60 feet,— the answer. If the Timber or Package is of larger breadth or thickness than is contained in the Table, add two numbers together.

L'ng	15 *Inches* Thick *by*												16 *Inches* Thick *by*											
ft. in	15	B	16	B	17	B	18	B	19	B	20	B	21	B	16	B	17	B	18	B	19	B	20	B	21	B	22	B
1	1	7	1	8	1	9	1	11	2	0	2	1	2	2	1	9	1	11	2	0	2	1	2	3	2	3	2	5
2	3	2	3	4	3	7	3	9	4	0	4	2	4	5	3	7	3	9	4	0	4	3	4	5	4	4	4	11
3	4	8	5	0	5	4	5	8	5	11	6	3	6	7	5	4	5	8	6	0	6	4	6	8	7	8	7	4
4	6	3	6	8	7	1	7	6	7	11	8	4	8	9	7	1	7	7	8	0	8	5	8	11	9	0	9	9
5	7	10	8	4	8	10	9	5	9	11	10	5	10	11	8	11	9	5	10	0	10	7	11	1	11	4	12	3
6	9	5	10	0	10	8	11	3	11	11	12	6	13	2	10	8	11	4	12	0	12	8	13	4	14	8	14	8
7	10	11	11	8	12	5	13	2	13	10	14	7	15	4	12	5	13	3	14	0	14	9	15	7	16	0	17	1
8	12	6	13	4	14	2	15	0	15	10	16	8	17	6	14	3	15	1	16	0	16	11	17	9	18	4	19	7
9	14	1	15	0	15	11	16	11	17	10	18	9	19	8	16	0	17	0	18	0	19	0	20	0	21	8	22	0
10	15	8	16	8	17	9	18	9	19	10	20	10	21	11	17	9	18	11	20	0	21	1	22	3	23	0	24	5
15	23	5	25	0	26	7	28	2	29	8	31	3	32	10	26	8	28	4	30	0	31	8	33	4	35	4	36	8
20	31	3	33	4	35	5	37	6	39	7	41	8	43	9	35	7	37	9	40	0	42	3	44	5	46	0	48	11
25	39	1	41	8	44	3	46	11	49	6	52	1	54	8	44	5	47	3	50	0	52	9	55	7	58	8	61	1
30	46	11	50	0	53	2	56	3	59	5	62	6	65	8	53	4	56	8	60	0	63	4	66	8	70	4	73	4
36	56	3	60	0	63	9	67	6	71	3	75	0	78	9	64	0	68	0	72	0	76	0	80	0	84	0	88	0
— 1	0	2	0	2	0	2	0	2	0	2	0	2	0	2	0	2	0	2	0	2	0	2	0	2	0	0	0	2
— 2	0	3	0	3	0	4	0	4	0	4	0	4	0	4	0	4	0	4	0	4	0	4	0	4	0	2	0	5
— 3	0	5	0	5	0	5	0	6	0	6	0	6	0	7	0	5	0	6	0	6	0	6	0	7	0	5	0	7
— 6	0	9	0	10	0	11	0	11	1	0	1	1	1	1	0	11	0	11	1	0	1	1	1	1	1	7	1	3

L'ng	17 *Inches* Thick *by*												18 *Inches* Thick *by*											
ft. in	17	B	18	B	19	B	20	B	21	B	22	B	23	B	18	B	19	B	20	B	21	B	22	B	23	B
1	2	0	2	2	2	3	2	4	2	6	2	7	2	9	2	3	2	5	2	6	2	8	2	9	2	11
2	4	0	4	3	4	6	4	9	5	0	5	2	5	5	4	6	4	9	5	0	5	3	5	6	5	9
3	6	0	6	5	6	9	7	1	7	5	7	10	8	2	6	9	7	2	7	6	7	11	8	3	8	8
4	8	0	8	6	9	0	9	5	9	11	10	5	10	10	9	0	9	6	10	0	10	6	11	0	11	6
5	10	0	10	8	11	3	11	10	12	5	13	0	13	7	11	3	11	11	12	6	13	2	13	9	14	5
6	12	1	12	9	13	6	14	2	14	11	15	7	16	4	13	6	14	3	15	0	15	9	16	6	17	3
7	14	1	14	11	15	8	16	6	17	4	18	2	19	0	15	9	16	8	17	6	18	5	19	3	20	2
8	16	1	17	0	17	11	18	11	19	10	20	9	21	9	18	0	19	0	20	0	21	0	22	0	23	0
9	18	1	19	2	20	2	21	3	22	4	23	5	24	5	20	3	21	5	22	6	23	8	24	9	25	11
10	20	1	21	3	22	5	23	7	24	10	26	0	27	2	22	6	23	9	25	0	26	3	27	6	28	9
15	30	1	31	11	33	8	35	5	37	2	39	0	40	9	33	9	35	8	37	6	39	5	41	3	43	2
20	40	2	42	6	44	10	47	3	49	7	51	11	54	4	45	0	47	6	50	0	52	6	55	0	57	6
25	50	2	53	2	56	1	59	0	62	0	64	11	67	11	56	3	59	5	62	6	65	8	68	9	71	11
30	60	3	63	9	67	4	70	10	74	5	77	11	81	6	67	6	71	3	75	0	78	9	82	6	86	3
36	72	8	76	6	80	9	85	0	89	3	93	6	97	9	81	0	85	6	90	0	94	6	99	0	103	6
— 1	0	2	0	2	0	2	0	2	0	2	0	3	0	3	0	2	0	2	0	3	0	3	0	3	0	3
— 2	0	4	0	4	0	4	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	6	0	6
— 3	0	6	0	6	0	7	0	7	0	7	0	8	0	8	0	7	0	7	0	8	0	8	0	8	0	9
— 6	1	0	1	1	1	1	1	2	1	3	1	4	1	4	1	2	1	2	1	3	1	4	1	5	1	5

L'ng	19 *Inches* Thick *by*												20 *Inches* Thick *by*											
ft. in	19	B	20	B	21	B	22	B	23	B	24	B	20	B	21	B	22	B	23	B	24	B	25	B
1	2	6	2	8	2	9	2	11	3	0	3	2	2	9	2	11	3	1	3	2	3	4	3	6
2	5	0	5	3	5	7	5	10	6	1	6	4	5	7	5	10	6	1	6	5	6	8	6	11
3	7	6	7	11	8	4	8	9	9	1	9	6	8	4	8	9	9	2	9	7	10	0	10	5
4	10	0	10	7	11	1	11	7	12	2	12	8	11	1	11	8	12	3	12	9	13	4	13	11
5	12	6	13	2	13	10	14	6	15	2	15	10	13	11	14	7	15	3	16	0	16	8	17	4
6	15	1	15	10	16	8	17	5	18	3	19	0	16	8	17	6	18	4	19	2	20	0	20	10
7	17	7	18	6	19	5	20	4	21	3	22	2	19	5	20	5	21	5	22	4	23	4	24	4
8	20	1	21	1	22	2	23	3	24	3	25	4	22	3	23	4	24	5	25	7	26	8	27	9
9	22	7	23	9	24	11	26	2	27	4	28	6	25	0	26	3	27	6	28	9	30	0	31	3
10	25	1	26	5	27	9	29	0	30	4	31	8	27	9	29	2	30	7	31	11	33	4	34	9
15	37	7	39	7	41	7	43	7	45	6	47	6	41	8	43	9	45	10	47	11	50	0	52	1
20	50	2	52	9	55	5	58	1	60	8	63	4	55	7	58	4	61	1	63	11	66	8	69	5
25	62	8	66	0	69	3	72	7	75	10	79	2	69	5	72	11	76	5	79	10	83	4	86	10
30	75	3	79	2	83	2	87	1	91	1	95	0	83	4	87	6	91	8	95	10	100	0	104	2
36	90	3	95	0	99	9	104	6	109	3	114	0	100	0	105	0	110	0	15	0	120	0	125	0
— 1	0	3	0	3	0	3	0	3	0	3	0	3	0	3	0	3	0	3	0	3	0	3	0	3
— 2	0	5	0	5	0	6	0	6	0	6	0	6	0	6	0	6	0	6	0	6	0	7	0	7
— 3	0	8	0	8	0	8	0	9	0	9	0	10	0	8	0	9	0	9	0	10	0	10	0	10
— 6	1	3	1	4	1	5	1	5	1	6	1	7	1	5	1	6	1	6	1	7	1	8	1	9

PLANK AND SCANTLING MEASURE.

If a Plank be longer than is represented in the Tables, then take *twice* some *length*. If shorter take ½ or ¼ of some *length*.

2 *Inches Thick, by* **10** *to* **28** *Inches Wide.*

Lng Ft.	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
13	22	24	26	28	30	33	35	37	39	41	43	46	48	50	52	54	56	59	61
14	23	26	28	30	33	35	37	40	42	44	47	49	51	54	56	58	61	63	65
15	25	28	30	33	35	38	40	43	45	48	50	53	55	58	60	63	65	68	70
16	27	29	32	35	37	40	43	45	48	51	53	56	59	61	64	67	69	72	75
17	28	31	34	37	40	43	45	48	51	54	57	60	62	65	68	71	74	77	79
18	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72	75	78	81	84
19	32	35	38	41	44	48	51	54	57	60	63	67	70	73	76	79	82	86	89
20	33	37	40	43	47	50	53	57	60	63	67	70	73	77	80	83	87	90	93
21	35	39	42	46	49	53	56	60	63	67	70	74	77	81	84	88	91	95	98
22	37	40	44	48	51	55	59	62	66	70	73	77	81	84	88	92	95	99	103
23	38	42	46	50	54	58	61	65	69	73	77	81	84	88	92	96	100	104	107
24	40	44	48	52	56	60	64	68	72	76	80	84	88	92	96	100	104	108	112
25	42	46	50	54	58	63	67	71	75	79	83	88	92	96	100	104	108	113	117
26	43	48	52	56	61	65	69	74	78	82	87	91	95	100	104	108	113	117	121
27	45	50	54	59	63	68	72	77	81	86	90	95	99	104	108	113	117	122	126
28	47	51	56	61	65	70	75	79	84	89	93	98	103	107	112	117	121	126	131
29	48	53	58	63	68	73	77	82	87	92	97	102	106	111	116	121	126	131	135
30	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130	135	140

2 1-2 *Inches Thick by* **10** *to* **27** *Inches Wide.*

Lng Ft.	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
13	27	30	33	35	38	41	43	46	49	51	54	57	60	62	65	68	70	73
14	29	32	35	38	41	44	47	50	53	55	58	61	64	67	70	73	76	79
15	31	34	38	41	44	47	50	53	56	59	63	66	69	72	75	78	81	84
16	33	37	40	43	47	50	53	57	60	63	67	70	73	77	80	83	87	90
17	35	39	43	46	50	53	57	60	64	67	71	74	78	81	85	89	92	96
18	38	41	45	49	53	56	60	64	68	71	75	79	83	86	90	94	98	101
19	40	44	48	51	55	59	63	67	71	75	79	83	87	91	95	99	103	107
20	42	46	50	54	58	63	67	71	75	79	83	88	92	96	100	104	108	113
21	44	48	53	57	61	66	70	74	79	83	88	92	96	101	105	109	114	118
22	46	50	55	60	64	69	73	78	83	87	92	96	101	105	110	115	119	124
23	48	53	58	62	67	72	77	81	86	91	96	101	105	110	115	120	125	129
24	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130	135
25	52	57	63	68	73	78	83	89	94	99	104	109	115	120	125	130	135	141
26	54	60	65	70	76	81	87	92	98	103	108	114	119	125	130	135	141	146
27	56	62	68	73	79	84	90	96	101	107	113	118	124	129	135	141	146	152
28	58	64	70	76	82	88	93	99	105	111	117	123	128	134	140	146	152	158
29	60	66	73	79	85	91	97	103	109	115	121	127	133	139	145	151	157	163
30	63	69	75	81	88	94	100	106	113	119	125	131	138	144	150	156	163	169

3 *Inches Thick by* **10** *to* **27** *Inches Wide.*

Lng Ft.	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
13	33	36	39	42	46	49	52	55	59	62	65	68	72	75	78	81	85
14	35	39	42	46	49	53	56	60	63	67	70	74	77	81	84	88	91
15	38	41	45	49	53	56	60	64	68	71	75	79	83	86	90	94	98
16	40	44	48	52	56	60	64	68	72	76	80	84	88	92	96	100	104
17	43	47	51	55	60	64	68	72	77	81	85	89	94	98	102	106	111
18	45	50	54	59	63	68	72	77	81	86	90	95	99	104	108	113	117
19	48	52	57	62	67	71	76	81	86	90	95	100	105	109	114	119	124
20	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130
21	53	58	63	68	74	79	84	89	95	100	105	110	116	121	126	131	137
22	55	61	66	72	77	83	88	94	99	105	110	116	121	127	132	138	143
23	58	63	69	75	81	86	92	98	104	109	115	121	127	132	138	144	150
24	60	66	72	78	84	90	96	102	108	114	120	126	132	138	144	150	156
25	63	69	75	81	88	94	100	106	113	119	125	131	138	144	150	156	163
26	65	72	78	85	91	98	104	111	117	124	130	137	143	150	156	163	169
27	68	74	81	88	95	101	108	115	122	128	135	142	149	155	162	169	176
28	70	77	84	91	98	105	112	119	126	133	140	147	154	161	168	175	182
29	73	80	87	94	102	109	116	123	131	138	145	152	160	167	174	181	189
30	75	83	90	98	105	113	120	128	135	143	150	158	165	173	180	188	195

PLANK AND SCANTLING MEASURE.

If a Plank, or Scantling, be longer than is represented in the Tables, take *twice* some *length* given in the Tables, or add two *lengths* together; if wider, take *two widths*; if both longer and wider, double the contents of such number in the Tables as will give the same length and width required.

3 1-2 *Inches Thick by* 10 *to* 26 *Inches Wide.*

Lng Ft.	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
13	38	42	46	49	53	57	61	64	68	72	76	80	83	87	91	95	99
14	41	45	49	53	57	61	65	69	74	78	82	86	90	94	98	102	106
15	44	48	53	57	61	66	70	74	79	83	88	92	96	101	105	109	114
16	47	51	56	61	65	70	75	79	84	89	93	98	103	107	112	117	121
17	50	55	60	64	69	74	79	84	89	94	99	104	109	114	119	124	129
18	53	58	63	68	74	79	84	89	95	100	105	110	116	121	126	131	137
19	55	61	67	72	78	83	89	94	100	105	111	116	122	127	133	139	144
20	58	64	70	76	82	88	93	99	105	111	117	123	128	134	140	146	152
21	61	67	74	80	86	92	98	104	110	116	123	129	135	141	147	153	159
22	64	71	77	83	90	96	103	109	116	122	128	135	141	148	154	160	167
23	67	74	81	87	94	101	107	114	121	127	134	141	148	154	161	168	174
24	70	77	84	91	98	105	112	119	126	133	140	147	154	161	168	175	182
25	73	80	88	95	102	109	117	124	131	139	146	153	160	168	175	182	190
26	76	83	91	99	106	114	121	129	137	144	152	159	167	174	182	190	197
27	79	87	95	102	110	118	126	134	142	150	158	165	173	181	189	197	205
28	82	90	98	106	114	123	131	139	147	155	163	172	180	188	196	204	212
29	85	93	102	110	118	127	135	144	152	161	169	178	186	195	203	211	220
30	88	96	105	114	123	131	140	149	158	166	175	184	193	201	210	219	228

4 *Inches Thick by* 10 *to* 26 *Inches Wide.*

Lng Ft.	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
13	43	48	52	56	61	65	69	74	78	82	87	91	95	100	104	108	113
14	47	51	56	61	65	70	75	79	84	89	93	98	103	107	112	117	121
15	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130
16	53	59	64	69	75	80	85	91	96	101	107	112	117	123	128	133	139
17	57	62	68	74	79	85	91	96	102	108	113	119	125	130	136	142	147
18	60	66	72	78	84	90	96	102	108	114	120	126	132	138	144	150	156
19	63	70	76	82	89	95	101	108	114	120	127	133	139	146	152	158	165
20	67	73	80	87	93	100	107	113	120	127	133	140	147	153	160	167	173
21	70	77	84	91	98	105	112	119	126	133	140	147	154	161	168	175	182
22	73	81	88	95	103	110	117	125	132	139	147	154	161	169	176	183	191
23	77	84	92	100	107	115	123	130	138	146	153	161	169	176	184	192	199
24	80	88	96	104	112	120	128	136	144	152	160	168	176	184	192	200	208
25	83	92	100	108	117	125	133	142	150	158	167	175	183	192	200	208	217
26	87	95	104	113	121	130	139	147	156	165	173	182	191	199	208	217	225
27	90	99	108	117	126	135	144	153	162	171	180	189	198	207	216	225	234
28	93	103	112	121	131	140	149	159	168	177	187	196	205	215	224	233	243
29	97	106	116	126	135	145	155	164	174	184	193	203	213	222	232	242	251
30	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250	260

5 *Inches Thick by* 10 *to* 26 *Inches Wide.*

Lng Ft.	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
13	54	60	65	70	76	81	87	92	98	103	108	114	119	125	130	135	141
14	58	64	70	76	82	88	93	99	105	111	117	123	128	134	140	146	152
15	63	69	75	81	88	94	100	106	113	119	125	131	138	144	150	156	163
16	67	73	80	87	93	100	107	113	120	127	133	140	147	153	160	167	173
17	71	78	85	92	99	106	113	120	128	135	142	149	156	163	170	177	184
18	75	83	90	98	105	113	120	128	135	143	150	158	165	173	180	188	195
19	79	87	95	103	111	119	127	135	143	150	158	166	174	182	190	198	206
20	83	92	100	108	117	125	133	142	150	158	167	175	183	192	200	208	217
21	88	96	105	114	123	131	140	149	158	166	175	184	193	201	210	219	228
22	92	101	110	119	128	138	147	156	165	174	183	193	202	211	220	229	238
23	96	105	115	125	134	144	153	163	173	182	192	201	211	220	230	240	249
24	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250	260
25	104	115	125	135	146	156	167	177	188	198	208	219	229	240	250	260	271
26	108	119	130	141	152	163	173	184	195	206	217	228	238	249	260	271	282
27	113	124	135	146	158	169	180	191	203	214	225	236	248	259	270	281	293
28	117	128	140	152	163	175	187	198	210	222	233	245	257	268	280	292	303
29	121	133	145	157	169	181	193	205	218	230	242	254	266	278	290	302	314
30	125	138	150	163	175	188	200	213	225	238	250	263	275	288	300	313	325

SCANTLING AND TIMBER MEASURE

REDUCED TO ONE INCH BOARD MEASURE.

EXPLANATION. — To ascertain the number of Feet of Scantling or Timber, say 18 Feet Long and 2 by 3 Inches. Find 2 by 3 in the top columns, and 18 in the left hand column, and under 2 by 3 and against 18 is 9 feet.

If the Scantling is longer than contained in the Table, add two lengths together. If shorter take part of some length.

The preceding pages also contain Scantling and Plank Measure.

Feet.	*Thickness and Width in Inches.*																
	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.4	4.5
6	2.	3.	4.	5.	6.	7.	8.	9.	4.6	6.	7.6	9.	10.6	12.	13.6	8.	10.
7	2.4	3.6	4.8	5.10	7.	8.2	9.4	10.6	5.3	7.	8.9	10.6	12.3	14.	15.9	9.4	11.8
8	2.8	4.	5.4	6.8	8.	9.4	10.8	12.	6.	8.	10.	12.	14.	16.	18.	10.8	13.4
9	3.	4.6	6.	7.6	9.	10.6	12.	13.6	6.9	9.	11.3	13.6	15.9	18.	20.3	12.	15.
10	3.4	5.	6.8	8.4	10.	11.8	13.4	15.	7.6	10.	12.6	15.	17.6	20.	22.6	13.4	16.8
11	3.8	5.6	7.4	9.2	11.	12.10	14.8	16.6	8.3	11.	13.9	16.6	19.3	22.	24.9	14.8	18.4
12	4.	6.	8.	10.	12.	14.	16.	18.	9.	12.	15.	18.	21.	24.	27.	16.	20.
13	4.4	6.6	8.8	10.10	13.	15.2	17.4	19.6	9.9	13.	16.3	19.6	22.9	26.	29.3	17.4	21.8
14	4.8	7.	9.4	11.8	14.	16.4	18.8	21.	10.6	14.	17.6	21.	24.6	28.	31 6	18.8	23.4
15	5.	7.6	10.	12.6	15.	17.6	20.	22.6	11.3	15.	18.9	22.6	26.3	30.	33.9	20.	25.
16	5.4	8.	10.8	13.4	16.	18.8	21.4	24.	12.	16.	20.	24.	28.	32.	36.	21.4	26.8
17	5.8	8.6	11.4	14.2	17.	19.10	22.8	25.6	12.9	17.	21.3	25.6	29.9	34.	38.3	22.8	28.4
18	6.	9.	12.	15.	18.	21.	24.	27.	13.6	18.	22.6	27.	31.6	36.	40.6	24.	30.
19	6.4	9.6	12.8	15.10	19.	22.2	25.4	28.6	14.3	19.	23.9	28.6	33.3	38.	42.9	25.4	31.8
20	6.8	10.	13.4	16.8	20.	23.4	26.8	30.	15.	20.	25.	30.	35.	40.	45	26.8	33.4
21	7.	10.6	14.	17.6	21.	24.6	28.	31 6	15.9	21.	26.3	31.6	36.9	42.	47.3	28.	35.
22	7.4	11.	14.8	18.4	22.	25.8	29.4	33.	16.6	22.	27.6	33.	38.6	44.	49.6	29.4	36.8
23	7.8	11.6	15.4	19.2	23.	26.10	30.8	34.6	17.3	23.	28.9	34.6	40.3	46.	51.9	30.8	38.4
24	8.	12.	16.	20.	24.	28.	32.	36.	18.	24.	30.	36.	42.	48.	54.	32.	40.
25	8.4	12.6	16.8	20.10	25.	29.2	33.4	37.6	18.9	25.	31.3	37.6	43.9	50.	56.3	33.4	41.8
30	10.	15.	20.	25.	30.	35.	40.	45.	22.6	30.	37.6	45.	52.6	60.	67.6	40.	50.
34	11.4	17.	22.8	28.4	34.	39.8	45.4	51.	25.6	34.	42.6	51.	59.6	68.	76.6	45.4	56.8
40	13.4	20.	26.8	33.4	40.	46.8	53.4	60.	30.0	40.	50.	60.	70.	80.	90.	53.4	66.8

Feet.	*Thickness and Width in Inches.*													
	4.6	4.7	4.8	4.9	5.5	5.6	5.7	5.8	5.9	6.6	6.7	6.8	6.9	6.10
6	12.	14.	16.	18.	12.6	15.	17.6	20.	22.6	18.	21.	24.	27.	30.
7	14.	16.4	18.8	21.	14.7	17.6	20.5	23.4	26.3	21.	24.6	28.	31.6	35.
7	16.	18.8	21.4	24.	16.8	20.	23.4	26.8	30.	24.	28.	32.	36.	40.
9	18.	21.	24.	27.	18.9	22.6	26.3	30.	33.9	27.	31.6	36.	40,6	45
10	20.	23 4	26.8	30.	20.10	25.	29.2	33.4	37.6	30.	35.	40.	45.	50.
11	22.	25.8	29.4	33.	22.11	27.6	32.1	36.8	41.3	33.	38.6	44.	49.6	55.
12	24.	28.	32.	36.	25.	30.	35.	40.	45.	36.	42.	48.	54.	60.
13	26.	30.4	34.8	39.	27.1	32.6	37.11	43.4	48.9	39.	45.6	52.	58.6	65.
14	28.	32.8	37.4	42.	29.2	35.	40.10	46.8	52.6	42.	49.	56.	63.	70.
15	30.	35.	40.	45.	31.3	37.6	43.9	50.	56.3	45.	52.6	60.	67.6	75.
16	32.	37.4	42.8	48.	33.4	40.	46.8	53.4	60.	48.	56.	64.	72.	80.
17	34.	39.8	45.4	51.	35.5	42.6	49.7	56.8	63.9	51.	59.6	68.	76.6	85.
18	36.	42.	48.	54.	37.6	45.	52.6	60.	67.6	54.	63.	72.	81.	90.
19	38.	44.4	50.8	57.	39.7	47.6	55.5	63.4	71.3	57.	66.6	76.	85.6	95.
20	40.	46.8	53.4	60.	41.8	50.	58.4	66.8	75.	60.	70.	80.	90.	100.
21	42.	49.	56.	63.	43.9	52.6	61.3	70.	78.9	63.	73.6	84.	94.6	105.
22	44.	51.4	58.8	66.	45.10	55.	64.2	73.4	82.6	66.	77.	88.	99.	110.
23	46.	53.8	61.4	69.	47.11	57.6	67.1	76.8	86.3	69.	80.6	92.	103.6	115.
24	48.	56.	64.	72.	50.	60.	70.	80.	90.	72.	84.	96.	108.	120.
25	50.	58.4	66.8	75.	52.1	62.6	72.11	83.4	93.9	75.	87.6	100.	112.6	125.
30	60.	70.	80.	90.	62.6	75.	87.6	100.	112.6	90.	105.	120.	135.	150.
34	68.	79.4	90.8	102.	70.10	85.	99.2	113.4	127.6	102.	119.	136.	153.	170.
40	80	93.4	106.8	120.	83.4	100.	116.8	133.4	150.	120.	140.	160.	180.	200.

Feet.	*Thickness and Width in Inches.*											
	6·11	6·12	7.7	7.8	7.9	7.10	7.11	7·12	8.8	8.9	8.10	8.11	8.12
6	33.	36.	24.6	28.	31.6	35.	38.6	42.	32.	36.	40.	44.	48.
7	38.6	42.	28.7	32.8	36.9	40.10	44.11	49.	37.4	42.	46.8	51.4	56.
8	44.	48.	32.8	37.4	42.	46.8	51.4	56.	42.8	48.	53.4	58.8	64.
9	49 6	54.	36.9	42.	47.3	52.6	57.9	63.	48.	54.	60.	66.	72.
10	55.	60.	40.10	46.8	52.6	58.4	64.2	70.	53.4	60.	66.8	73.4	80.
11	60.6	66.	44.11	51.4	57.9	64.2	70.7	77.	58.8	66.	73.4	80.8	88.
12	66.	72.	49.	56.	63.	70.	77.	84.	64.	72	80.	88.	96.
13	71.6	78.	53.1	60.8	68.3	75.10	83.5	91.	69.4	78.	86.8	95.4	104.
14	77.	84.	57.2	65.4	73.6	81.8	89·10	98.	74.8	84.	93.4	102.8	112.
15	82.6	90.	61.3	70.	78.9	87.6	96.3	105.	80.	90.	100.	110.	120.
16	88.	96.	65.4	74.8	84.	93.4	102.8	112.	85.4	96.	106.8	117.4	128.
17	93.6	102.	69.5	79.4	89.3	99.2	109.1	119.	90.8	102.	113.4	124.8	136.
18	99.	108.	73.6	84.	94.6	105.	115.6	126.	96.	108.	120.	132.	144.
19	104.6	114.	77.7	88.8	99.9	110.10	121.11	133.	101.4	114.	126.8	139.4	152.
20	110.	120.	81.8	93.4	105.	116.8	128.4	140.	106.8	120.	133.4	146.8	160.
21	115.6	126.	85.9	98.	110.3	122.6	134.9	147.	112.	126.	140.	154.	168.
22	121.	132.	89.10	102.8	115.6	128.4	141.2	154.	117.4	132.	146.8	161.4	176.
23	126.6	138.	93 11	107.4	120.9	134.2	147.7	161.	122.8	139.	153.4	168.8	184.
24	132.	144.	98.	112.	126.	140.	154.	168.	128.	144.	160.	176.	192.

Feet.	*Thickness and Width in Inches.*											
	9.9	9.10	9.11	9.12	10.10	10.11	10.12	11.11	11·12	12·12	12.13	12.14
6	40.6	45.	49.6	54.	50.	55.	60.	60.6	66.	72.	78.	84.
7	47.3	52.6	57.9	63.	58.4	64.2	70.	70.7	77.	84.	91.	98.
8	54.	60.	66.	72.	66.8	73.4	80.	80.8	88.	96.	104.	112.
9	60.9	67.6	74.3	81.	75.	82.6	90.	90.9	99.	108.	117.	126.
10	67.6	75.	82.6	90.	83.4	91.8	100.	100.10	110.	120.	130.	140.
11	74.3	82.6	90.9	99.	91.8	100.10	110.	110.11	121.	132.	143.	154.
12	81.	90.	99.	108.	100.	110.	120.	121.	132.	144.	156.	168.
13	87.9	97.6	107.3	117.	108.4	119.2	130.	131.1	143.	156.	169.	182.
14	94.6	105.	115.6	126.	116.8	128.4	140.	141.2	154.	168.	182.	196.
15	101.3	112.6	123.9	135.	125.	137.6	150.	151.3	165.	180.	195.	210.
16	108.	120.	132.	144.	133.4	146.8	160.	161.4	176.	192.	208.	224.
17	114.9	127.6	140.3	153.	141.8	155.10	170.	171.5	187.	204.	221.	238.
18	121.6	135.	148.6	162.	150.	165.	180.	181.6	198.	216.	234.	252.
19	128.3	142.6	156.9	171.	158.4	174.2	190.	191.7	209.	228.	247.	266.
20	135.	150.	165.	180.	166.8	183.4	200.	201.8	220.	240.	260.	280.
21	141.9	157.6	173.3	189.	175.	192.6	210.	211.9	231.	252.	273.	294.
22	148.6	165.	181.6	198.	183.4	201.8	220.	221.10	242.	264.	286.	308.
23	155.3	172.6	189.9	207.	191.8	210.10	230.	231.11	253.	276.	299.	322.
24	162.	180.	198.	216.	200.	220.	240.	242.	264.	288.	312.	336.

Feet.	*Thickness and Width in Inches.*											
	12.15	12.16	13.13	13·14	13·15	13.16	14.14	14.15	14.16	15.15	15.16
6	90.	96.	84.6	91.	97.6	104.	.98	105.	112.	112 6	120.
7	105	112.	98.7	106.2	113.9	121.4	114.4	122.6	130.8	131.3	140.
8	120.	128.	112.8	121.4	130.	138.8	130.8	140.	149.4	150.	160.
9	135.	144.	126.9	136.6	146.3	156.	147.	157.6	168.	168.9	180.
10	150.	160.	140.10	151.8	162.6	173.4	163.4	175.	186.8	187.6	200.
11	165.	176.	154.11	166.10	178.9	190.8	179.8	192.6	205.4	206.3	220.
12	180.	192.	169.	182.	195.	208.	196.	210.	224.	225.	240.
13	195.	208.	183.1	197.2	211.3	225.4	212.4	227.6	242.8	243.9	260.
14	210.	224.	197.2	212.4	227.6	242.8	228.8	245.	261.4	262.6	280.
15	225.	240.	211.3	227.6	243.9	260.	245.	262.6	280.	281.3	300.
16	240.	256.	225.4	242.8	260.	277.4	261.4	280.	298.8	300.	320.
17	255.	272.	239.5	257.10	276.3	294.8	277.8	297.6	317.4	318.9	340.
18	270.	288.	243.6	273.	292.6	312.	290.	314.	336.	337.6	360.
19	285.	304.	257.7	288.2	308.9	329.4	310.4	332.6	354.8	356.3	380.
20	300.	320.	271.8	303.4	325.	346.8	326.8	350.	373.4	375.	400.
21	315.	336.	285.9	318.6	341.3	364.	343.	367.6	392.	393.9	420.
22	330.	352.	299.10	333.8	357.6	381.4	359.4	385.	410.8	412.6	440.
23	345.	368.	313.11	348.10	373.9	398.8	375.8	402.6	429.4	431.3	460.
24	360.	384.	338.	364.	390.	416.	392.	420.	448.	450.	480.

BOARD AND PLANK MEASUREMENT — AT SIGHT.

This Table gives the Square Feet and Inches in Boards from 6 to 25 inches wide and from 8 to 36 feet long. If a board be longer than 36 feet, unite two numbers. For instance, if a Board is 40 feet long and 16 inches wide—add 30 and 10 and you have 53 ft. 4 in. For 2 inch Plank double the PRODUCT. See also Board Table, p. 84.

Feet Long.	6 in W		7 in W		8 in W		9 in W		10 in W		11 in W		12 in W		13 in W		14 in W		15 in W	
	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.
8	4	0	4	8	5	4	6	0	6	8	7	4	8	0	8	8	9	4	10	0
9	4	6	5	3	6	0	6	9	7	6	8	3	9	0	9	9	10	6	11	3
10	5	0	5	10	6	8	7	6	8	4	9	2	10	0	10	10	11	8	12	6
11	5	6	6	5	7	4	8	3	9	2	10	1	11	0	11	11	12	10	13	9
12	6	0	7	0	8	0	9	0	10	0	11	0	12	0	13	0	14	0	15	0
13	6	6	7	7	8	8	9	9	10	10	11	11	13	0	14	1	15	2	16	3
14	7	0	8	2	9	4	10	6	11	8	12	10	14	0	15	2	16	4	17	6
15	7	6	8	9	10	0	11	3	12	6	13	9	15	0	16	3	17	6	18	9
16	8	0	9	4	10	8	12	0	13	4	14	8	16	0	17	4	18	8	20	0
17	8	6	9	11	11	4	12	9	14	2	15	7	17	0	18	5	19	10	21	3
18	9	0	10	6	12	0	13	6	15	0	16	6	18	0	19	6	21	0	22	6
19	9	6	11	1	12	8	14	3	15	10	17	5	19	0	20	7	22	2	23	9
20	10	0	11	8	13	4	15	0	16	8	18	4	20	0	21	8	23	4	25	0
21	10	6	12	3	14	0	15	9	17	6	19	3	21	0	22	9	24	6	26	3
22	11	0	12	10	14	8	16	6	18	4	20	2	22	0	23	10	25	8	27	6
23	11	6	13	5	15	4	17	3	19	2	21	1	23	0	24	11	26	10	28	9
24	12	0	14	0	16	0	18	0	20	0	22	0	24	0	26	0	28	0	30	0
25	12	6	14	7	16	8	18	9	20	10	22	11	25	0	27	1	29	2	31	3
26	13	0	15	2	17	4	19	6	21	8	23	10	26	0	28	2	30	4	32	6
27	13	6	15	9	18	0	20	3	22	6	24	9	27	0	29	3	31	6	33	9
28	14	0	16	4	18	8	21	0	23	4	25	8	28	0	30	4	32	8	35	0
29	14	6	16	11	19	4	21	9	24	2	26	7	29	0	31	5	33	10	36	3
30	15	0	17	6	20	0	22	6	25	0	27	6	30	0	32	6	35	0	37	6
31	15	6	18	1	20	8	23	3	25	10	28	5	31	0	33	7	36	2	38	9
32	16	0	18	8	21	4	24	0	26	8	29	4	32	0	34	8	37	4	40	0
33	16	6	19	3	22	0	24	9	27	6	30	3	33	0	35	9	38	6	41	3
34	17	0	19	10	22	8	25	6	28	4	31	2	34	0	36	10	39	8	42	6
35	17	6	20	5	23	4	26	3	29	2	32	1	35	0	37	11	40	10	43	9
36	18	0	21	0	24	0	27	0	30	0	33	0	36	0	39	0	42	0	45	0

BOARD TABLE MEASUREMENT — CONTINUED.

Feet	16 in W		17 in W		18 in W		19 in W		20 in W		21 in W		22 in W		23 in W		24 in W		25 in W	
	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.
8	10	8	11	4	12	0	12	8	13	4	14	0	14	8	15	4	16	0	16	8
9	12	0	12	9	13	6	14	3	15	0	15	9	16	6	17	3	18	0	18	9
10	13	4	14	2	15	0	15	10	16	8	17	6	18	4	19	2	20	0	20	10
11	14	8	15	7	16	6	17	5	18	4	19	3	20	2	21	1	22	0	22	11
12	16	0	17	0	18	0	19	0	20	0	21	0	22	0	23	0	24	0	25	0
13	17	4	18	5	19	6	20	7	21	8	22	9	23	10	24	11	26	0	27	1
14	18	8	19	10	21	0	22	2	23	4	24	6	25	8	26	10	28	0	29	2
15	20	0	21	3	22	6	23	9	25	0	26	3	27	6	28	9	30	0	31	3
16	21	4	22	8	24	0	25	4	26	8	28	0	29	4	30	8	32	0	33	4
17	22	8	24	1	25	6	26	11	28	4	29	9	31	2	32	7	34	0	35	5
18	24	0	25	6	27	0	28	6	30	0	31	6	33	0	34	6	36	0	37	6
19	25	4	26	11	28	6	30	1	31	8	33	3	34	10	36	5	38	0	39	7
20	26	8	28	4	30	0	31	8	33	4	35	0	36	8	38	4	40	0	41	8
21	28	0	29	9	31	6	33	3	35	0	36	9	38	6	40	3	42	0	43	9
22	29	4	31	2	33	0	34	10	36	8	38	6	40	4	42	2	44	0	45	10
23	30	8	32	7	34	6	36	5	38	4	40	3	42	2	44	1	46	0	47	11
24	32	0	34	0	36	0	38	0	40	0	42	0	44	0	46	0	48	0	50	0
25	33	4	35	5	37	6	39	7	41	8	43	9	45	10	47	11	50	0	52	1
26	34	8	36	10	39	0	41	2	43	4	45	6	47	8	49	10	52	0	54	2
27	36	0	38	3	40	6	42	9	45	0	47	3	49	6	51	9	54	0	56	2
28	37	4	39	8	42	0	44	4	46	8	49	0	51	4	53	8	56	0	58	4
29	38	8	41	1	43	6	45	11	48	4	50	9	53	2	55	7	58	0	60	5
30	40	0	42	6	45	0	47	6	50	0	52	6	55	0	57	6	60	0	62	6

LOGS REDUCED TO ONE INCH BOARD MEASURE.

RULE.—The number of feet is obtained by subtracting *one quarter* from the *diameter* of the Log. *Example.*—If a log is 12 feet long, and 12 inches diameter, deducting one quarter from the diameter, leaves 9 inches, making 9 boards 9 inches wide, each board measuring 9 feet. Now multiply the number of boards by the number of feet in one board, and the product will be 81 feet.

The Diameter of all Timber is to be taken 20 feet from the butt. All logs short of 20 feet, take the Diameter at the top or small end.

If the Log is longer than is contained in the table, take any two lengths.

The first column on the left gives the length of the Log in feet. The figures under D denote the diameters of the Logs in inches.

Lgs. Ft.	D. 10	D. 11	D. 12	D. 13	D. 14	D. 15	D. 16	D. 17	D. 18	D. 19	D. 20	D. 21	D. 22	D. 23	D. 24
10	47	57	68	79	92	105	120	135	152	169	188	207	227	248	270
11	52	62	74	87	101	116	132	149	167	186	206	227	250	273	297
12	56	68	81	95	110	127	144	163	182	203	225	248	272	298	324
13	61	74	88	103	119	137	156	176	197	220	244	269	295	322	351
14	66	79	95	111	129	148	168	190	213	237	263	289	318	347	378
15	70	85	101	119	138	158	180	203	228	254	281	310	340	372	405
16	75	91	108	127	147	169	192	217	243	271	300	331	363	397	432
17	80	96	115	135	156	179	204	230	258	288	319	351	386	422	459
18	84	102	122	143	165	190	216	244	273	305	338	372	408	446	486
19	89	108	128	150	175	200	228	257	289	322	356	393	431	471	513
20	94	113	135	158	184	211	240	271	304	338	375	413	454	496	540
21	98	119	142	166	193	221	252	284	319	355	394	434	476	521	567
22	103	125	149	174	202	232	264	298	334	372	413	455	499	546	594
23	108	130	155	182	211	243	276	312	349	389	431	475	522	570	621
24	113	136	162	190	220	253	288	325	364	406	450	496	544	595	648
25	117	142	169	198	230	264	300	339	380	423	469	517	567	620	675
26	122	147	176	206	239	274	312	352	395	440	488	537	590	645	702
27	127	153	182	214	248	285	324	366	410	457	506	558	613	670	729
28	131	159	189	222	257	295	336	379	425	474	525	579	635	694	756
29	136	164	196	230	266	306	348	393	440	491	544	599	658	719	783
30	141	170	203	238	276	316	360	406	456	508	563	620	681	744	810
31	145	176	209	246	285	327	372	420	471	525	581	641	703	769	837
35	164	198	236	277	322	369	420	474	532	592	656	724	794	868	945

Lgs. Ft.	D. 25	D. 26	D. 27	D. 28	D. 29	D. 30	D. 31	D. 32	D. 33	D. 34	D. 35	D. 36
10	293	317	342	368	394	422	450	480	510	542	574	608
11	322	349	376	404	434	464	496	528	562	596	632	668
12	352	380	410	441	473	506	541	576	613	650	689	729
13	381	412	444	478	512	548	586	624	664	704	746	790
14	410	444	478	515	552	591	631	672	715	759	804	851
15	439	475	513	551	591	633	676	720	766	813	861	911
16	469	507	547	588	631	675	721	768	817	867	919	972
17	498	539	581	625	670	717	766	816	868	921	976	1033
18	527	570	615	662	710	759	811	864	919	975	1034	1094
19	557	602	649	698	749	802	856	912	970	1030	1091	1154
20	586	634	683	735	788	844	901	960	1021	1084	1148	1215
21	615	665	718	772	828	886	946	1008	1072	1138	1206	1276
22	645	697	752	809	867	928	991	1056	1123	1192	1263	1337
23	674	729	786	845	907	970	1036	1104	1174	1246	1321	1397
24	703	761	820	882	946	1012	1081	1152	1225	1300	1378	1458
25	732	792	854	919	986	1055	1126	1200	1276	1355	1436	1519
26	762	824	888	956	1025	1097	1171	1248	1327	1409	1493	1580
27	791	856	923	992	1064	1139	1216	1296	1378	1463	1550	1640
28	820	887	957	1029	1104	1181	1261	1344	1429	1517	1608	1701
29	850	919	991	1066	1143	1223	1306	1392	1480	1571	1665	1762
30	879	951	1025	1103	1183	1266	1351	1440	1531	1626	1723	1823
31	908	982	1059	1139	1222	1308	1396	1488	1582	1680	1780	1883
35	1025	1109	1196	1286	1380	1477	1577	1680	1787	1897	2010	2126

CONTENTS, IN CUBIC FEET, OF CYLINDERS, MASTS, SPARS, AND ROUND LOGS.

The 1st column on the left gives the *Length* of the *Log, Mast or Spar*, in feet. The figures under D, at the *top* of the page, denote the average diameter in inches. If the Log or Spar is longer than is contained in the Table, take the product of any two or more lengths. To obtain the average diameter, add together the diameters of the two ends, and divide by two.

Length.	D. 10	D. 11	D. 12	D. 13	D. 14	D. 15	D. 16	D. 17	D. 18	D. 19	D. 20	D. 21	D. 22	D. 23
8	4½	5½	6¼	7½	8½	9¾	11¼	12½	14¼	15¾	17½	19¼	21	23
9	5	6	7	8¼	9¾	11	12⅝	14¼	16	17¾	19⅝	21⅝	23¾	26
10	5½	6½	7¾	9½	10¾	12¼	14	15¾	17¾	19⅝	21½	24¼	26½	28¾
11	6	7¼	8¾	10¾	11¾	13½	15½	17½	19½	21½	24	26½	29	31¾
12	6½	8	9½	11	12¾	14¾	16¾	19	21¼	23½	26½	28¾	31¾	34½
13	7	8½	10¼	12	14	16	18¼	20½	23	25½	28½	31¼	34¼	37½
14	7½	9¼	11	13	15	17¼	19½	22	24¾	27¼	30½	33⅝	37	40¼
15	8¼	10	11¾	13¾	16	18¼	21	23¾	26¼	29	32¾	36	39½	43¼
16	8¾	10½	12¾	14¾	17	19¾	22¾	25¼	28¼	31¼	35	38½	42¾	46¼
17	9¼	11¼	13¼	15¾	18¼	20¾	23¾	26¼	30	33¼	37	41	44¾	49
18	9¾	11¾	14¼	16¼	19¼	22	25¼	28¼	31¾	35¼	39¼	43¼	47½	52
19	10¼	12¼	15	17¼	20¼	23¼	26¾	30	33¼	37¼	41¼	45¾	50¼	54¾
20	11	13	15¾	18¼	21¼	24¼	28	31½	35¼	39	43¼	48	52¾	57¾
21	11½	13¾	16¼	19¼	22¾	25¾	29¼	33	37	41	45½	50½	55½	60¼
22	12	14¼	17¾	20¼	23¾	27	30¾	34¾	38¾	43¼	48	53	58	63¼
23	12½	15¼	18	21¼	24¾	28¼	32	36¼	40¾	45	50¼	55½	60¾	66¼
24	13	15¾	18¾	22	25¾	29¼	33¼	37¾	42¼	47¼	52½	57¾	63¼	69¼
25	13¾	16¼	19¾	23	26¾	30¾	35	39½	44¼	49	54½	60¼	66	72¼
26	14	17¼	20¼	24	27¾	32	36¼	41	46	51¼	56¾	62½	68¾	75
27	14¾	17¾	21¼	25	28¾	33¼	37¾	42¼	47¾	53	59	65	71¼	78
28	15¼	18¼	22	25¾	30	34¼	39	44¼	49¼	55	61	67¼	74	80¾
29	15¾	19¼	22¾	26¾	31	35¾	40¼	45¾	51¼	57	63¼	69¾	76¼	83¼
30	16¼	19¾	23¼	27¼	32	36¾	42	47¼	53	59	65¼	72¼	79¼	86½

Length.	D. 24	D. 25	D. 26	D. 27	D. 28	D. 29	D. 30	D. 31	D. 32	D. 33	D. 34	D. 53	D. 36
8	25¼	27½	29½	31¾	34¼	36¾	39½	42	44¾	47½	50½	53½	56½
9	28½	30¾	33¼	35¾	38½	41¼	44¼	47½	50¾	53¾	56¾	60¼	63½
10	31¾	34	36¾	39½	42¾	45¾	49	52½	55¾	59¼	63	66¾	70¾
11	34¾	37½	40¼	43¾	47	50½	54	57¾	61½	65¼	69½	73½	77¾
12	37¾	41	44¼	47¾	51¼	55	59	63	67	71¼	75¾	80¼	84¾
13	40¾	44¼	48	51¾	55¾	59¾	63¾	68¼	72¼	77¼	82	86¾	92
14	44	47¾	51¼	55¾	59¾	64¼	68¾	73¼	78¼	83¼	88¼	93½	99
15	47	51¼	55¼	59¾	64¼	68¾	73¾	78¾	83¾	89	94¾	100¼	106
16	50¼	54½	59	63¼	68¼	73½	78¾	83¾	89¾	95	101	107	113
17	53½	58	62¾	67½	72¾	78	83¼	89	95	101	107¼	113½	120¼
18	56¾	61½	66¼	71¾	77	82½	88½	94¼	100½	107	113½	120¼	127¼
19	59¾	64¾	70	75¼	81¼	87¼	93¼	99½	106	112¾	119¾	127	134¼
20	62¾	68	73¾	79¼	85¼	91¾	98¼	104¾	111¾	118¾	126	133½	141¾
21	66	71½	77½	83½	89¾	96¼	103	110	117¼	124¾	132½	140¾	148½
22	69	75	81	87¾	94	101	108	115¼	122¾	130¾	138¾	147	155¼
23	72½	78¼	84¾	91¼	98¼	105½	113	120½	128¼	136¼	145	153¾	162¼
24	75¾	81¾	88¼	95¼	102½	110	117¾	125¾	134	142½	151½	160¼	169¾
25	78¾	85¼	92¼	99¼	107	114¾	122¾	131	139½	148¼	157½	167	176¾
26	81¾	88¾	95¾	103¼	111¼	119¼	127¼	136½	145¼	154¼	164	173¾	183¾
27	84¾	92	99¼	107¼	115¾	123¾	132¼	141¼	150¾	160¼	170¼	180¾	190¼
28	88	95¼	103¼	111¼	119¾	128¼	137¼	146¼	156¼	166¼	176¾	187	198¼
29	91	98¾	107	115¼	124	133	142¼	152	162	172½	182¾	193¾	205
30	94½	102¼	110½	119¼	128¼	138¼	147¼	157½	167¼	178¼	189½	200½	212

ROUND TIMBER AND LOGS.

Corresponding to ¼th Girt.

To obtain the average diameter, add together the diameters of the two ends and divide the sum by 2.

If the diameter of a Log be more than a whole number, take the mean between two numbers.

If the Log be longer than contained in the Table, add two lengths together. One-half of a foot or less is not counted. All over one-half is counted as one foot.

Length.	D. 10	D. 11	D. 12	D 13	D. 14	D. 15	D. 16	D. 17	D. 18	D. 19	D. 20	D. 21	D. 22	D. 23
8	3	4	5	6	6	7	8	9	11	12	13	14	16	17
9	4	4	5	6	7	8	9	11	12	13	15	16	18	19
10	4	5	6	7	8	9	10	12	13	15	16	18	20	22
11	5	5	6	8	9	10	12	13	15	16	18	20	22	24
12	5	6	7	8	10	11	13	14	16	18	20	22	24	26
13	5	6	8	9	10	12	14	15	17	19	21	23	26	28
14	6	7	8	10	11	13	14	17	19	21	23	25	28	30
15	6	7	9	10	12	14	16	18	20	22	25	27	30	32
16	7	8	9	11	13	15	17	19	21	24	26	29	32	35
17	7	9	10	12	14	16	18	20	23	25	28	31	34	37
18	7	9	11	12	14	17	19	21	24	27	29	32	36	39
19	8	9	11	13	15	17	20	22	25	28	31	34	38	41
20	8	10	12	14	16	18	21	24	27	30	33	36	40	43
21	9	10	12	15	17	19	22	25	28	31	34	38	42	45
22	9	11	13	15	18	20	23	26	29	32	36	40	44	48
23	9	11	14	16	18	21	24	27	30	34	38	41	46	50
24	10	12	14	17	19	22	25	28	32	35	39	43	48	52
25	10	12	15	17	20	23	26	30	33	37	41	45	50	54
26	11	13	15	18	21	24	27	31	34	38	43	47	51	56
27	11	13	16	19	22	25	28	32	36	40	44	49	53	58
28	11	14	17	19	22	26	29	33	37	41	46	51	55	61
29	12	14	17	20	23	27	30	34	38	43	47	52	57	63
30	12	15	18	21	24	28	31	35	40	44	49	54	59	65

Length.	D. 24	D. 25	D. 26	D. 27	D. 28	D. 29	D. 30	D. 31	D. 32	D. 33	D. 34	D. 35	D. 36
8	19	20	22	24	26	28	29	31	34	36	38	40	42
9	21	23	25	27	29	31	33	35	38	40	43	45	48
10	24	26	28	30	32	34	37	39	42	45	47	50	53
11	26	28	30	33	35	38	41	43	46	49	52	55	58
12	28	31	33	36	38	41	44	47	50	53	57	60	64
13	31	33	36	39	42	45	48	51	54	58	61	65	69
14	33	36	39	42	45	48	52	55	59	62	66	70	74
15	35	38	41	45	48	52	55	59	63	67	71	75	80
16	38	41	44	48	51	55	59	63	67	71	76	80	85
17	40	43	47	51	55	58	63	67	71	76	80	85	90
18	42	46	50	54	58	62	66	71	75	80	85	90	95
19	45	49	53	57	61	65	70	75	80	85	90	95	101
20	47	51	55	60	64	69	74	79	84	89	95	100	106
21	49	54	58	63	67	72	77	83	88	94	99	105	111
22	52	56	61	66	71	76	81	86	92	98	104	110	117
23	54	59	64	69	74	79	85	90	96	102	109	115	122
24	57	61	66	72	77	83	88	94	101	107	113	120	127
25	59	64	69	75	80	86	92	98	105	111	118	125	133
26	61	66	72	78	83	89	96	102	109	116	123	130	138
27	64	69	75	81	87	93	99	106	113	120	128	135	143
28	66	72	77	84	90	96	103	110	117	125	132	140	148
29	68	74	80	86	93	100	107	114	121	129	137	145	154
30	71	77	83	89	96	104	110	118	126	134	142	150	159

WEIGHT OF WOODS.

Comparative Weight of Different Woods; the Weight per Cubic Foot, in lbs.; and the Number of Cubic Feet which equal one Ton in Weight.

	Weight of a cubic foot in lbs. and decimal parts	Number of feet equal to 1 ton in weight.		Weight of a cubic foot in lbs. and decimal parts.	Number of feet equal to 1 ton in weight.
Lignum vitæ . .	83.31	26.88	White oak, upl'd	43.	52.09
American ebony.	83.18	26.93	Yellow Fir . .	41.06	54.55
French box . .	83.00	26.98	Walnut . . .	41.93	53.42
Indian ebony . .	75.56	29.64	Red pine . .	41.06	54.55
Live oak . . .	70.00	32.00	Beech	38.90	57.58
Oak, just felled .	69.56	32.20	Sycamore, chest-		
Spanish mahogany	66.43	33.72	nut & lime tree.	37.75	59.33
Olive tree . . .	57.93	38.67	Cherry . . .	37.86	59.16
Logwood . . .	57.06	39.25	Hacmetac . .	37.10	60.37
Dutch box . . .	57.00	39.40	Willow . . .	36.50	61.37
Hickory (red) . .	52.28	42.84	Cedar	35.06	63.89
Alder	50.00	44.80	White Fir . .	35.57	62.97
Apple tree . . .	49.56	45.18	Yellow pine .	33 71	66.44
White oak Jas.Riv.	47.44	47.21	Larch	33.02	67.86
Plum tree . . .	47.18	47.47	White Sp. poplar.	32.96	67 96
Maple	47.00	47.66	White pine . .	30.	74.66
Teak	46 87	47.79	Cypress . . .	27.55	81.3
Oak, seasoned .	46.43	47.74	Common poplar	23.93	93.60
Ash	45.	49.77	Cork	15.00	149.33
Elm	42.06	53.25			

ENGLISH CARPENTRY.

[*From the Engineer's and Contractor's Pocket Book*—London, 1855.]

The fir timber in general use is imported from Memel, Riga, Dantzic, and Sweden. Memel timber is the most convenient for size, Riga the best in quality, Dantzic the strongest, and Swedish the toughest. Riga timber can always be depended upon; red pine may be used wherever durability and strength are objects; and Quebec yellow pine for light, dry purposes.

Deals are from Norway, Sweden, Prussia, and Russia.

For framing, the best deals are the Norway, particularly the Christiana battens; for pannelling, the Christiana white deals; for ground floors, Stockholm and Gefle yellows; for upper floors, Dram and Christiana whites; Archangel and Onega planks for warehouse floors and staircases; and for best floors, &c., Petersburgh, Onega, and Christiana battens.

100 Superficial feet make one square of boarding, flooring, &c.
120 deals are denominated one hundred.
50 cubic feet of timber equal one load. Also,
600 superficial feet of inch boards equal one load.
Battens are 7 in. in breadth, deals, 9 in., and planks 11 in.
12½ 12-ft. boards to one square of rough boarding or flooring.
12⅔ " edges shot.
13 " wrought and laid folding.
13⅓ " " " straight joint.
14 " " " ploughed and tongued.
17 12-ft. battens to one square of wrought folding floor.
18 " yellow to a straight joint floor.

NOTE.—On account of the war in Europe, large quantities of Battens, &c., are exported from the British North American Provinces. To those engaged in supplying the English markets, the Tables of Planks, Deals, Battens, &c., with the English prices, at page 188, may be found useful.

ARTIFICERS'

RULES AND TABLES.

ARTIFICERS' RULES.

FOR COMPUTING THE WORK OF BRICKLAYERS, WELL DIGGERS, MASONS, CARPENTERS AND JOINERS, SLATERS, PLASTERERS, PAINTERS, GLAZIERS, PAVERS, AND PLUMBERS.

MEASUREMENT OF BRICKLAYERS' WORK.

Brickwork is estimated at the rate of a number of bricks in thickness, estimating a brick at 4 inches thick. The dimensions of a building are usually taken by measuring half round on the outside, and half round on the inside; the sum of these two gives the compass of the wall,—to be multiplied by the height, for the content of the materials. Chimneys are by some measured as if they were solid, deducting only the vacuity from the hearth to the mantel, on account of the trouble of them. And by others they are girt or measured round for their breadth, and the height of the story is their height, taking the depth of the jambs for their thickness. And in this case, no deduction is made for the vacuity from the floor to the mantel-tree, because of the gathering of the breast and wings, to make room for the hearth in the next story. To measure the chimney shafts, which appear above the building, gird them about with a line for the breadth, to multiply by their height. And account their thickness half a brick more than it really is, in consideration of the plastering and scaffolding. All windows, doors, &c., are to be deducted out of the contents of the walls in which they are placed. But this deduction is made only with regard to materials; for the whole measure is taken for workmanship, and that all outside measure too, namely, measuring quite round the outside of the building, being in consideration of the trouble of the returns or angles. There are also some other allowances, such as double measure for feathered gable ends, &c.

EXAMPLE.—The end wall of a house is 28 feet long, and 37 feet high to the eaves: 15 feet high is four bricks or 16 inches thick, other 12 feet is three bricks or 12 inches thick, and the remaining 10 feet is two bricks or 8 inches thick; above which is a triangular gable 12 feet high and one brick or 4 inches in thickness. What number of bricks are there in the said wall? *Ans.* 25,620.

			thickness.	
	28 × 15 = 420	× 4 =	1680	contents of 1st story.
	28 × 12 = 336	× 3 =	1008	" " 2d "
	28 × 10 = 280	× 2 =	560	" " 3d "
12 ÷ 2 =	6 × 28 = 168	× 1 =	168	" " gable.
			3416	square feet area of whole wall.
			7½	bricks to square foot.
			23,912	
			1,708	
Answer,—			25,620 bricks.	

By the table

3000	superfi.	ft. =	22,500 bricks.
400	"	" =	3,000 "
10	"	" =	75 "
6	"	" =	45 "
3416	"	" =	25,620 bricks.

A Table by which to ascertain the number of Bricks necessary to construct any Piece of Building, from a four-inch Wall to twenty-four inches in Thickness.

The utility of the Table (on next page) can be seen by the following Example. Required the number of bricks to build a wall of 12 inches thickness, and containing an area of 6,437 square feet.

Square feet	1000	22,500 bricks—See table.
	× 6	6
	6000 =	135 000
	400 =	9,000
	30 =	675
	7 =	158
	6,437 =	144,833 bricks.

NOTE.—7½ bricks, including mortar, equal one superficial foot.

Superficial feet of Wall.	Number of Bricks to Thickness of					
	4-inch	8-inch.	12-inch.	16-inch.	20-inch.	24-inch.
1	8	15	23	30	38	45
2	15	30	45	60	75	90
3	23	45	68	90	113	135
4	30	60	90	120	150	180
5	38	75	113	150	188	225
6	45	90	135	180	225	270
7	53	105	158	210	263	315
8	60	120	180	240	300	360
9	68	135	203	270	338	405
10	75	150	225	300	375	450
20	150	300	450	600	750	900
30	225	450	675	900	1125	1350
40	300	600	900	1200	1500	1800
50	375	750	1125	1500	1875	2250
60	450	900	1350	1800	2250	2700
70	525	1050	1575	2100	2625	3150
80	600	1200	1800	2400	3000	3600
90	675	1350	2025	2700	3375	4050
100	750	1500	2250	3000	3750	4500
200	1500	3000	4500	6000	7500	9000
300	2250	4500	6750	9000	11250	13500
400	3000	6000	9000	12000	15000	18000
500	3750	7500	11250	15000	18750	22500
600	4500	9000	13500	18000	22500	27000
700	5250	10500	15750	21000	26250	31500
800	6000	12000	18000	24000	30000	36000
900	6750	13500	20250	27000	33750	40500
1000	7500	15000	22500	30000	37500	45000

MEASUREMENT OF WELLS AND CISTERNS.

There are two methods of estimating the value of excavating. It may be done by allowing so much a day for every man's work, or so much per cubic foot, or yard, for all that is excavated.

Well Digging. — Suppose a Well is 40 feet deep, and 5 feet in diameter, required the number of cubic feet, or yards?

$$5 \times 5 = 25 \times .7854 = 19.6355 \times 40 = 785.42 \text{ cubic feet.}$$

[See Rules for obtaining the contents of *Cylindrical Vessels.*]

[To estimate the number of cubic feet of earth taken from Wells and Cisterns, see Table "*Areas of Circles*". This Table gives the area of any cylindrical measure from 1 to 30 inches; but calling the area *feet*, and multiplying it by the length in feet, the contents in cubic feet of any cylindrical measure is obtained, from 1 foot to 30 feet in diameter. To obtain the number of standard gallons, multiply the cubic feet by 7.48, and the product is the number of gallons. By this Table the contents in cubic feet or gallons of any cistern, well, water tank, or other cylindrical measure, is more readily obtained than by any other method.]

Digging for Foundations, &c.— To find the cubical quantity in a trench, or an excavated area, the length, width, and depth must be multiplied together. These are usually given in feet, and therefore, to reduce the amount into cubic yards it must be divided by 27.

Suppose a trench is 40 feet long, 3 feet wide, and 3 feet deep, required the number of cubic feet, or yards?

$$40 \times 3 = 120 \times 3 = 360 \text{ feet} \div 27 = 13\tfrac{1}{3} \text{ yards.}$$

[See Rules for obtaining the contents of *Square Vessels.*]

24 cubic feet of sand, 17 ditto clay, 18 ditto earth, equal one ton.

1 cubic yard of earth or gravel, before digging, will occupy about 1¼ cubic yards when dug.

MEASUREMENT OF MASONS' WORK.

To masonry belong all sorts of stone-work; and the measure made use of is a foot, either superficial or solid.

Walls, columns, blocks of stone or marble, &c., are measured by the cubic

foot; and pavements, slabs, chimney-pieces, &c., by the superficial or square foot. Cubic or solid measure is used for the materials, and square measure for the workmanship. In the solid measure, the true length, breadth and thickness, are taken, and multiplied continually together. In the superficial, there must be taken the length and breadth of every part of the projection, which is seen without the general upright face of the building.

EXAMPLE. — In a chimney-piece, suppose the length of the mantel and slab each 4 feet 6 inches; breadth of both together 3 feet 2 inches; length of each jamb 4 feet 4 inches; breadth of both together 1 foot 9 inches. Required the superficial content. — *Ans.* 21 feet 10 inches.

4 ft. 6 in. × 3 ft. 2 in. = 14 ft. 3 in.
4 " 4 " × 1 " 9 " = 7 " 7 "
} 21 feet 10 inches.

[To find the contents in *Superficial Feet*, of Brick or Stone Walls, &c., of any length and breadth, see Table and Examples, showing the *breadth and area of a Lineal Foot.*]

Rubble Walls (unhewn stone) are commonly measured by the perch, which is 16½ feet long, 1 foot deep, and 1½ foot thick, equivalent to 24¾ cubic feet. 25 cubic feet is sometimes allowed to the perch, in measuring stone before it is laid, and 22 after it is laid in the wall. This species of work is of two kinds, coursed and uncoursed; in the former the stones are guaged and dressed by the hammer, and the masonry laid in horizontal courses, but not necessarily confined to the same height. The uncoursed rubble wall is formed by laying the stones in the wall as they come to hand, without any previous guaging or working.

27 cubic feet of mortar require for its preparation, 9 bushels of lime and 1 cubic foot of sand.

Lime and sand lessen about one-third in bulk when made into mortar; likewise cement and sand.

Lime, or cement and sand, to make mortar, require as much water as is equal to one-third of their bulk.

All sandstones ought to be placed on their natural beds; from inattention to this circumstance, the stones often split off at the joints, and the position of the lamina much sooner admits of the destructive action of air and water.

The heaviest stones are most suited for docks and harbors, breakwaters to bridges, &c.

Granite is the most durable species of stone yet known for the purposes of building. It varies in weight according to quality; the heaviest is the most durable.

EASUREMENT OF CARPENTERS' AND JOINERS' WORK.

To this branch belongs all the wood work of a house, such as flooring, partitioning, roofing, &c. Large and plain articles are usually measured by the square foot or yard, &c., but enriched mouldings, and some other articles, are often estimated by running or lineal measures, and some things are rated by the piece.

All *joists, girders*, and in fact all the parts of naked flooring, are measured by the cube, and their quantities are found by multiplying the length by the breadth, and the product by the depth. The same rule applies to the measurement of all the timbers of a roof, and also the framed timbers used in the construction of partitions.

Flooring, that is to say, the boards which cover the naked flooring, is measured by the square. The dimensions are taken from wall to wall, and the product is divided by 100, which gives the number of squares; but deductions must be made for staircases and chimneys.

In measuring of joists, it is to be observed, that only one of their dimensions is the same with that of the floor; for the other exceeds the length of the room by the thickness of the wall, and one-third of the same, because each end is let into the wall about two-thirds of its thickness.

No deductions are made for hearths, on account of the additional trouble and waste of materials.

Partitions are measured from wall to wall for one dimension, and from floor to floor, as far as they extend, for the other.

No deduction is made for door-ways, on account of the trouble of framing them.

In measuring of joiners' work, the string is made to ply close to every part of the work over which it passes.

The measure for centering for CELLARS is found by making a string pass over the surface of the arch for the breadth, and taking the length of the cellar for

the length; but in groin centering, it is usual to allow double measure, on account of their extraordinary trouble.

In *roofing*, the length of the house in the inside, together with two-thirds of the thickness of one gable, is to be considered as the length; and the breadth is equal to double the length of a string which is stretched from the ridge down the rafter, and along the eaves-board, till it meets with the top of the wall.

For *staircases*, take the breadth of all the steps, by making a line ply close over them, from the top to the bottom, and multiply the length of this line by the length of a step, for the whole area.— By the length of a step is meant the length of the front and the returns at the two ends; and by the breadth, is to be understood the girth of its two outer surfaces, or the tread and riser.

For the *balustrade*, take the whole length of the upper part of the handrail, and girt over its end till it meet the top of the newel post, for the length; and twice the length of the baluster upon the landing, with the girth of the handrail for the breadth.

For *wainscoting*, take the compass of the room for the length; and the height from the floor to the ceiling, making the string ply close into all the mouldings for the breadth. Out of this must be made deductions for windows, doors, and chimneys, &c., but workmanship is counted for the whole, on account of the extraordinary trouble.

For *doors*, it is usual to allow for their thickness, by adding it to both dimensions of length and breadth, and then to multiply them together for the area. If the door be paneled on both sides, take double its measure for the workmanship; but if the one side only be paneled, take the area and its half for the workmanship. — For the *surrounding architrave*, gird it about the outermost parts for its length; and measure over it, as far as it can be seen when the door is open, for the breadth.

Window-shutters, *bases*, *&c.*, are measured in the same manner.

In the measuring of roofing for workmanship alone, holes for chimney-shafts and sky-lights are generally deducted. But in measuring for work and materials, they commonly measure in all sky-lights, lutheran-lights, and holes for the chimney-shafts, on account of their trouble and waste of materials.

The doors and shutters, being worked on both sides, are reckoned work and half work.

Hemlock and *Pine* Shingles are generally 18 inches long, and of the average width of 4 inches. When nailed to the roof 6 inches are generally left out to the weather, and 6 shingles are therefore required to a square foot. *Cedar* and *Cypress* Shingles are generally 20 inches long, and 6 inches wide, and therefore a less number are required for a "square." On account of waste and defects, 1000 shingles should be allowed to a square.

Two 4 penny nails are allowed to each shingle, equal to 1200 to a square.

The weight of a square of partitioning may be estimated at from 1500 to 2000 lbs.; a square of single-joisted flooring, at from 1200 to 2000 lbs.; a square of framed flooring, at from 2700 to 4500 lbs; a square of deafening, at about 1500 lbs. 100 superficial feet make one square of boarding, flooring, &c.

In selecting Timber, avoid spongy heart, porous grain, and dead knots; choose the brightest in color, and where the strong red grain appears to rise on the surface.

The *Carpenter* and *Joiner* will find in this work, TABLES giving the solid contents of Timber and Logs; the square feet in Scantling from 2.2 to 15.16 inches; the square feet in Boards and Planks; the contents of Logs in standard Board measure; the strength and weight of Iron Cylinders, Trusses, Plates, Cast Iron for Beams, and Hoop Iron.

Number of American Iron Machine Cut Nails, in a pound, (by count.)

Size.	Number.	Size.	Number.	Size.	Number.
3 penny	408	6 penny	156	12 penny	52
4 "	275	8 "	100	20 "	32
5 "	227	10 "	66	30 "	25

SASH TABLE.— *Size* and *Prices* of *Sashes*, *Shutters*, *&c.* HINKLE, GOULD, & Co., 365 W. Front Street, Cincinnati, Ohio.

Size of Lights.	Thickness.	Size of Sash for 12 light Windows.		Price of Sash per Light.	Price of Venetian Shutters per pair.	Price of Window Frames.	
		Width.	Length.			Box.	Common.
Inches.	In.	feet. in.	feet. in.	cts.	$ cts.	$ cts.	$ cts.
8 by 10	1 1/8	2 4	3 10	4	1 37 1/2	2 00	1 20
8 by 10	1 3/8	2 4	3 10	5	1 62 1/2	2 00	1 20
9 by 12	1 1/8	2 7 1/2	4 6 1/2	5	1 62 1/2	2 50	1 30
9 by 12	1 3/8	2 7 1/2	4 6 1/2	6	1 75	2 50	1 30
10 by 12	1 1/8	2 10 1/2	4 6 1/2	5	1 62 1/2	2 50	1 30
10 by 12	1 3/8	2 10 1/2	4 6 1/2	6	1 75	2 50	1 30
10 by 14	1 3/8	2 10 1/2	5 2 1/2	7	2 12 1/2	2 75	1 40
10 by 15	1 3/8	2 10 1/2	5 6 1/2	7 1/2	2 25	2 75	1 40
10 by 16	1 3/8	2 10 1/2	5 10 1/2	8	2 37 1/2	3 20	1 50
11 by 15	1 3/8	3 2	5 6 1/2	8	2 37 1/2	3 20	1 50
11 by 16	1 3/8	3 2	5 10 1/2	8 1/2	2 50	3 35	1 60
11 by 17	1 3/8	3 2	6 2 1/2	8 1/2	2 62 1/2	3 50	1 70
12 by 16	1 3/8	3 5	5 10 1/2	8 1/2	2 62 1/2	3 75	1 80
12 by 18	1 3/8	3 5	6 6 1/2	9	2 87 1/2	4 00	1 90
12 by 20	1 3/8	3 5	7 2 1/2	10	3 12 1/2	4 25	2 12 1/2
12 by 22	1 3/8	3 5	7 10 1/2	11	3 37 1/2	4 50	2 30
12 by 24	1 3/8	3 5	8 6 1/2	12	3 62 1/2	4 75	2 50

Sash 1 1-2 or 1 3-4 inches thick, add 1 1-2 cents per light, to 1 3-8 inch prices; for Ploughing and Boring sash, add 1-2 cent per light; all 1 3-8 sash are made with hook rails.
Venitian Shutters, 1 1-2 or 1 3-4 inches thick, add 50 cents per pair to 1 3-8 inch prices. Shutters are made 1 1-4 inches longer than sash. Pivot or Rolling Shutters, extra price.

MEASUREMENT OF SLATERS' WORK.

In these articles, the content of a roof is found by multiplying the length of the ridge by the girth over from eaves to eaves; making allowance in this girth for the double row of slates at the bottom, or for how much one row of slates is laid over another. When the roof is of a true pitch, that is, forming a right angle at top, then the breadth of the building with its half added, is the girth over both sides. In angles formed in a roof, running from the ridge to the eaves, when the angle bends inwards, it is called a valley; but when outwards, it is called a hip. It is not usual to make deductions for chimney-shafts, sky-lights or other openings.

SLATES. [*From the Quarries of Rutland County, Vermont.*]

3 inch Cover.		2 inch Cover.	3 inch Cover.		2 inch Cover.
Sizes of Slates.	No. of Slates to the Square or 100 Feet.	No. of slates to the square or 100 Feet.	Sizes of Slates.	No. of Slates to the Square or 100 Feet.	No. of slates to the square or 100 Feet.
24 by 16	86	84	18 by 11	174 1/4	163 1/2
24 by 14	98	93 1/2	18 by 10	192	180
24 by 12	114	109	18 by 9	213	200
22 by 14	108	102 1/4	16 by 12	184	171 1/2
22 by 12	126	120	16 by 10	221 1/2	205 3/4
22 by 10	152	144	16 by 9	246	228 1/2
20 by 14	129	114 1/4	16 by 8	277	257
20 by 12	143	133 1/2	14 by 10	262	240
20 by 11	146	145 1/2	14 by 9	293	266 1/2
20 by 10	169 1/4	160	14 by 8	327	300
18 by 12	160	150	14 by 7	374	343

"Each Slate is 3 inches BOND or COVER. Slates from the Brownsville Quarries, Me., are 2 inch cover. The rule for measuring Slating is, to add one foot for all hips and valleys. No deduction is made for Lutheran windows, skylights or chimneys, except they are of unusual size; then one half is deducted."—[D. Tillson & Son, Slaters, 37 State St. Boston].

IMPORTED SLATES.

A. Wilbur & Co., corner of Tremont Row and Howard Streets, Boston.

Names of Slates.	Sizes. Inches.	Inches.	Number of Superficial Feet each M of 1200 will cover.	Weight of M each of 1200 Slates.
Duchesses, ...	24 by	12	1100	60 cwt.
Marchionesses, . . .	22 "	12	1000	55 "
Countesses, ...	20 "	10	750	40 "
Viscountesess, . . .	18 "	10	666 2-3	36 "
Ladies, ...	16 "	10	583 1-3	31 "
do.	16 "	8	466 2-3	25 "
do.	14 "	8	400	22 "
do.	12 "	8	333 1-3	18 1-2 "
Plantations, ...	14 "	12	600	33 "
do.	13 "	10	458 1-3	25 "
do.	12 "	10	416 2-3	23 "
Doubles, ...	13 "	7	320 5-6	17 1-2 "
do. small, . . .	11 "	7	262 1-2	14 1-2 "
School Slates for	5 ft. by	2 1-2 ft		
Blackboards, ...	5 feet by	3 feet.		

MEASUREMENT OF PLASTERERS' WORK.

Plasterers' work is of two kinds, namely, ceiling—which is plastering upon laths—and rendering, which is plastering upon walls, which are measured separately.

The contents are estimated either by the foot or yard, or square of 100 feet. Enriched mouldings, &c., are rated by running or lineal measure. One foot extra is allowed for each mitre.

One half of the openings, windows, doors, &c., allowed to compensate for trouble of finishing returns at top and sides.

Cornices and mouldings, if 12 inches or more in girt, are sometimes estimated by the sq. ft.; if less than 12 inches they are usually measured by the lineal foot.

1 bushel of cement will cover 1 1-7 square yards at 1 inch in thickness.
do. do. do. 1½ do. do. ¾ do. do.
do. do. do. 2½ do. do. ½ do. do.

1 bushel of cement and 1 of sand will cover 2½ sq. yds. at 1 inch in thickness.
do. do. do. do. 3 do. ¼ do. do.
do. do. do. do. 4½ do. ¼ do. do.

1 bushel of cement and 2 of sand will cover 3½ square yds. at 1 inch in thickness.
do. do. do. do. 4½ do. ¾ do. do.
do. do. do. do. 6¾ do. ¼ do. do.

1 cwt. of mastic and 1 gallon of oil will cover 1½ yards at ¾, or 2½ at ½ inch.

1 cubic yard of lime, 2 yards of road or drift sand, and 3 bushels of hair, will cover 75 yards of *render and set* on brick, and 70 yards on lath, or 65 yards *plaster*, or *render*, 2 *coats and set* on brick, and 60 yards on lath; floated work will require about the same as 2 coats and set.

Laths are 1½ to 1½ inches by 4 feet in length, and are usually set ⅓th of an inch apart. A bundle contains 100. 1 bundle of laths and 500 nails cover about 4½ yds.

MEASUREMENT OF PAVERS' WORK.

Pavers' work is done by the square yard. And the content is found by multiplying the length by the breadth. Grading for paving is charged by the day.

MEASUREMENT OF PAINTERS' WORK.

Painters' work is computed in square yards. Every part is measured where the color lies; the measuring line is forced into all the mouldings and corners.

Cornices, mouldings, narrow skirtings, reveals to doors and windows, and generally all work not more than nine inches wide, are valued by their length. Sash-frames are charged so much each according to their size, and the squares so much a dozen. Mouldings, cut in, are charged by the foot run, and the workman always receives an extra price for party-colors. Writing is charged by the inch, and the price given is regulated by the skill and manner in which the work is executed; the same is true of imitations and marbling. The price of painting varies exceedingly, some colors being more expensive and requiring much more labor than others. In measuring open railing, it is customary to take it as flat work, which pays for the extra labor; and as the rails are painted on all sides, the two surfaces are taken. It is customary to allow all edges and sinkings.

MEASUREMENT OF GLAZIERS' WORK.

Glaziers' work is sometimes measured by the sq. ft., sometimes by the piece, or at so much per light; except where the glass is set in metallic frames, when the charge is by the foot In estimating by the sq. ft., it is customary to include the whole sash. Circular or oval windows are measured as if they were square.

Table showing the Size and Number of Lights to the 100 *Square Feet.* [*Caleb G. Loring & Co., Glass Dealers, No.* 10 *Merchants' Row, Boston.*]

Size.	Lights.	Size.	Lights.	Size.	Lights.	Size.	Lights.
6 by 8	300	12 by 14	86	14 by 22	47	20 by 20	36
7 by 9	229	12 by 15	80	14 by 24	43	20 by 22	33
8 by 10	180	12 by 16	75	15 by 15	64	20 by 24	30
8 by 11	164	12 by 17	71	15 by 16	60	20 by 25	29
8 by 12	150	12 by 18	67	15 by 18	53	20 by 26	28
9 by 10	160	12 by 19	63	15 by 20	48	20 by 28	26
9 by 11	146	12 by 20	60	15 by 21	46	21 by 27	25
9 by 12	133	12 by 21	57	15 by 22	44	22 by 24	27
9 by 13	123	12 by 22	55	15 by 24	40	22 by 26	25
9 by 14	114	12 by 23	52	16 by 16	56	22 by 28	23
9 by 16	100	12 by 24	50	16 by 17	53	24 by 28	21
10 by 10	144	13 by 14	79	16 by 18	50	24 by 30	20
10 by 12	120	13 by 15	74	16 by 20	45	24 by 32	19
10 by 13	111	13 by 16	69	16 by 21	43	25 by 30	19
10 by 14	103	13 by 17	65	16 by 22	41	26 by 36	15
10 by 15	96	13 by 18	61	16 by 24	38	28 by 34	15
10 by 16	90	13 by 19	58	17 by 17	50	30 by 40	12
10 by 17	85	13 by 20	55	17 by 18	47	31 by 36	13
10 by 18	80	13 by 21	53	17 by 20	42	31 by 40	12
11 by 11	119	13 by 22	50	17 by 22	38	31 by 42	12
11 by 12	109	13 by 24	46	17 by 24	35	32 by 42	10
11 by 13	101	14 by 14	73	18 by 18	44	32 by 44	10
11 by 14	94	14 by 15	68	18 by 20	40	33 by 45	10
11 by 15	87	14 by 16	64	18 by 22	36	34 by 46	9
11 by 16	82	14 by 17	60	18 by 24	33	30 by 52	9
11 by 17	77	14 by 18	57	19 by 19	40	32 by 56	8
11 by 18	73	14 by 19	54	19 by 20	38	33 by 56	8
12 by 12	100	14 by 20	51	19 by 22	34	36 by 58	7
12 by 13	92	14 by 21	49	19 by 24	32	38 by 58	7

MEASUREMENT OF PLUMBERS' WORK.

Plumbers' work is rated at so much a pound, or else by the hundred weight, of 112 pounds. Sheet lead, used in roofing, guttering, &c., is from 7 to 12 lbs. to the square foot. And a pipe of an inch bore is commonly from 6 to 13 lbs. to the yard in length. — [See Table, "*Weight of Lead Pipe per Foot*"]

SIZES OF LEAD PIPE AND WEIGHT PER FOOT

Patent Improved Lead Pipe. GEORGE L. STEVENS, Water St., Boston.

Calibre.	Weight per foot.	Calibre	Weight per foot.	Calibre	Weight per foot.	Calibre	Weight per foot.	Calibre.	Weight per foot.
Inches.	lbs. ozs.	Inches.	lbs. ozs.	Inches.	lbs. ozs.	Inches.	lbs. ozs.	Inches.	lbs. ozs.
⅜	6	⅛	1 4	¾	1 4	1	4 0	1½	5 0
"	8	"	1 8	"	2 0	"	6 0	1¾	5 0
"	10	"	2 0	"	2 4	1¼	2 8	2	5 0
"	12	"	3 0	"	2 8	"	3 0	"	6 0
"	1 0	⅝	14	"	3 0	"	3 8	"	7 0
"	1 8	"	1 0	"	4 0	"	4 0	2½ } 1-4 in. thick.	11 0
½	8	"	1 8	1	1 8	"	5 0	3	13 0
"	10	"	2 0	"	1 12	1⅛	3 0	3½	15 0
"	12	"	2 12	"	2 0	"	3 8	4	18 0
"	14	¾	12	"	2 8	"	4 0	4½	20 0
"	1 0	"	14	"	3 0	"	4 8	5	22 0

SHEET LEAD.—Weight of a Square Foot, 2½, 3, 3½, 4, 4½, 5, 6, 7, 8½, 9, 10 lbs. and upwards.

Boston Lead Company. F. S. CARRUTH & J. H. CHADWICK, Agents, Custom House, Street, Boston.

1-2 Inch.		5-8 Inch.		3-4 Inch.		1 Inch.		1 1-4 Inch.		1 1-2 Inch.		1 3-4 Inch.		2 Inch.	
lbs.	*oz.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*	*oz.*
	10	2	12	1	1	1	8	2	4	3	5	3	10	4	12
	12	3		1	6	1	12	2	8	3	12	4	3	5	8
	16			1	12	2		2	13	4	4	5	2	7	12
1	4			2	4	2	6	3	3	4	10				
1	8			3	2	2	14	3	15	6					
1	11			3	14	3	13								
1	14					5									
2	4					6	4								

Comparative Strength and Weight of Ropes and Chains.

Circum. of Rope in inches.	Weight per Fathom in lbs.	Diameter of Chain in inches.	Weight per Fathom in lbs.	Proof Strength in tons and cwt.		Circum. of Rope in inches.	Weight per Fathom in lbs.	Diameter of Chain in inches.	Weight per Fathom in lbs.	Proof Strength in tons and cwt.	
3½	2¾	5/16	5½	1	5½	10	23	⅞	43	10	0
4¼	4¾	⅜	8	1	16¾	10¾	28	15/16	49	11	11
5	5¾	7/16	10½	2	10	11½	30½	1 in.	56	13	8
5¾	7	½	14	3	5½	12¼	36	1 1/16	63	14	18
6½	9¾	9/16	18	4	3½	13	39	1⅛	71	16	14
7	11¼	⅝	22	5	2	13¾	45	1 3/16	79	18	11
8	15	11/16	27	6	4½	14½	48½	1¼	87	20	8
8¾	19	¾	32	7	7	15¼	56	1 5/16	96	22	13
9½	21	13/16	37	8	13½	16	60	1⅜	106	24	18

NOTE.—It must be understood and also borne in mind, that, in estimating the amount of tensile strain to which a body is subjected, the weight of the body itself must also be taken into account; for according to its position so may it approximate to its whole weight in tending to produce extension within itself; as in the almost constant application of ropes and chains to great depths, considerable heights, &c.

STRENGTH OF MATERIALS OF CONSTRUCTION.

[*From Templeton's Workshop Companion.*]

MATERIALS of construction are liable to four different kinds of strain; viz., stretching, crushing, transverse action, and torsion or twisting: the first of which depends upon the body's tenacity alone; the second, on its resistance to compression; the third, on its tenacity and compression combined; and the fourth, on that property by which it opposes any acting force tending to change from a straight line, to that of a spiral direction, the fibres of which the body is composed.

In bodies, the power of tenacity and resistance to compression, in the direction of their length, is as the cross section of their area multiplied by the results of experiments on similar bodies, as exhibited in the following tables.

Table showing the Tenacities, Resistances to Compression, and other Properties of the common Materials of Construction.

Names of Bodies.	Absolute.		Compared with Cast Iron.		
	Tenacity in lbs. per sq. inch.	Resistance to compression in lbs. per sq. inch.	Its strength is	Its extensibility is	Its stiffness is
Ash, . . .	14130		0.23	2.6	0.089
Beech, . . .	12225	8548	0.15	2.1	0.073
Brass, . . .	17968	10304	0.435	0.9	0.49
Brick, . . .	275	562			
Cast Iron, . .	13434	86397	1.000	1.0	1.000
Copper (wrought), .	33000				
Elm, . . .	9720	1033	0.21	2.9	0.073
Fir, or Pine, white,	12346	2028	0.23	2.4	0.1
" " Red, .	11800	5375	0.3	2.4	0.1
" " Yellow,	11835	5445	0.25	2.9	0.087
Granite (Aberdeen),		10910			
Gun-metal (copper 8, and tin 1). . .	35838		0.65	1.25	0.535
Malleable Iron, .	56000		1.12	0.86	1.3
Larch, . . .	12240	5568	0.136	2.3	0.0585
Lead, . . .	1824		0.096	2.5	0.038
Mahogany, Honduras,	11475	8000	0.24	2.9	0.487
Marble, . . .	551	6060			
Oak, ...	11880	9504	0.25	2.8	0.093
Rope (1 in. in circum.)	200				
Steel, . . .	128000				
Stone, Bath, . .	478				
" Craigleith, ,	772	5490			
" Dundee, .	2661	6630			
" Portland, .	857	3729			
Tin (cast) . .	4736		0.182	0.75	0.25
Zinc (sheet) . .	9120		0.365	0.5	0.76

See Table of Comparative Weights of Ropes and Chains.

RESISTANCE TO LATERAL PRESSURE, OR TRANSVERSE ACTION.

The strength of a square or rectangular beam to resist lateral pressure, acting in a perpendicular direction to its length, is as the breadth and square of the depth, and inversely as the length;—thus, a beam twice the breadth

of another, all other circumstances being alike, equal twice the strength of the other; or twice the depth, equal four times the strength, and twice the length, equal only half the strength, &c., according to the rule.

Table of Data, containing the Results of Experiments on the Elasticity and Strength of various Species of Timber, by Mr. Barlow.

Species of Timber.	Value of E.	Value of S.	Species of Timber.	Value of E.	Value of S.
Teak, . .	174.7	2462	Elm, . . .	50.64	1013
Poona, . .	122.26	2221	Pitch pine, .	88.68	1632
English Oak, .	105.	1672	Red pine, . .	133.	1341
Canadian do. .	155.5	1766	New England Fir.	158.5	1102
Dantzic do. .	86.2	1457	Riga Fir, . .	90.	1100
Adriatic do. .	70.5	1383	Mar Forest do.	63.	1200
Ash, . . .	119.	2026	Larch, . .	76.	900
Beech, . .	98.	1556	Norway Spruce.	105.47	1474

To find the dimensions of a beam capable of sustaining a given weight, with a given degree of deflection, when supported at both ends.

RULE.—Multiply the weight to be supported in lbs. by the cube of the length in feet; divide the product by 32 times the tabular value of E, multiplied into the given deflection in inches; and the quotient is the breadth multiplied by the cube of the depth in inches.

NOTE 1.—When the beam is intended to be square, then the fourth root of the quotient is the breadth and depth required.

NOTE 2.—If the beam is to be cylindrical, multiply the quotient by 1.7, and the fourth root of the product is the diameter.

EX. The distance between the supports of a beam of Riga fir is 16 feet, and the weight it must be capable of sustaining in the middle of its length is 8000 lbs, with a deflection of not more than $\frac{3}{4}$ of an inch; what must be the depth of the beam, supposing the breadth 8 inches?

$$\frac{16 \times 8000}{90 \times 32 \times .75} = 15175 \div 8 = \sqrt[3]{1897} = 12.35 \text{ in., the depth.}$$

To determine the absolute strength of a rectangular beam of timber, when supported at both ends, and loaded in the middle of its length, as beams in general ought to be calculated to, so that they may be rendered capable of withstanding all accidental cases of emergency.

RULE.—Multiply the tabular value of S by four times the depth of the beam in inches, and by the area of the cross section in inches; divide the product by the distance between the supports in inches, and the quotient will be the absolute strength of the beam in lbs.

NOTE 1.—If the beam be not laid horizontally, the distance between the supports, for calculation, must be the horizontal distance.

NOTE 2.—One fourth of the weight obtained by the rule, is the greatest weight that ought to be applied in practice as permanent load.

NOTE 3.—If the load is to be applied at any other point than the middle, then the strength will be as the product of the two distances is to the square of half the length of the beam between the supports;—or, twice the distance from one end, multiplied by twice from the other, and divided by the whole length, equal the effective length of the beam.

EX. In a building 18 feet in width, an engine boiler of 5½ tons (2240 lbs. to a ton) is to be fixed, the center of which to be 7 feet from the wall, and having two pieces of red pine, 10 inches by 6, which I can lay across the two walls for the purpose of slinging it at each end,—may I with sufficient confidence apply them, so as to effect this object?

$$2240 \times 5.5 \div 2 = 6160 \text{ lbs. to carry at each end.}$$

And 18 feet $- 7 = 11$, double each, or 14 and 22, then $14 \times 22 \div 18 = 17$ feet, or 204 inches, effective length of beam.

Tabular value of S, red pine, $= 1341 \times 4 \times 10 \times 60 \div 204 = 15776$ lbs. the absolute strength of each piece of timber at that point.

To determine the dimensions of a rectangular beam capable of supporting a required weight, with a given degree of deflection, when fixed at one end.

RULE.—Divide the weight to be supported, in lbs., by the tabular value of E, multiplied by the breadth and deflection, both in inches; and the cube root of the quotient, multiplied by the length in feet, equal the depth required in inches.

EX. A beam of ash is intended to bear a load of 700 lbs. at its extremity; its length being 5 feet, breadth 4 inches, and the deflection not to exceed $\frac{1}{2}$ an inch.

Tabular value of $E = 119 \times 4 \times .5 = 238$ the divisor;

then $700 \div 238 = \sqrt[3]{2.94} \times 5 = 7.25$ inches, depth of the beam.

To find the absolute strength of a rectangular beam, when fixed at one end, and loaded at the other.

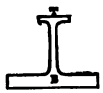
RULE.—Multiply the value of S by the depth of the beam, and by the area of its section, both in inches; divide the product by the leverage in inches, and the quotient equal the absolute strength of the beam in lbs.

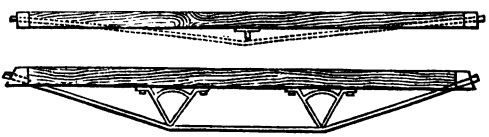
EX. A beam of Riga fir, 12 inches by $4\frac{1}{2}$, and projecting $6\frac{1}{2}$ feet from the wall; what is the greatest weight it will support at the extremity of its length?

Tabular value of $S = 1100$. $12 \times 4.5 = 54$ sectional area.

Then, $1100 \times 12 \times 54 \div 78 = 9138.4$ lbs.

When fracture of a beam is produced by vertical pressure, the fibres of the lower section of fracture are separated by extension, whilst at the same time those of the upper portion are destroyed by compression; hence exists a point in section where neither the one nor the other takes place, and which is distinguished as the point of neutral axis. Therefore, by the law of fracture thus established, and proper data of tenacity and compression given, as in the table, (p. 31) we are enabled to form metal beams of strongest section with the least possible material. Thus, in cast iron, the resistance to compression is nearly as $6\frac{1}{2}$ to 1 of tenacity, consequently a beam of cast iron, to be of strongest section, must be of the following form, and a parabola in the direction of its length, the quantity of material in the bottom flange being about $6\frac{1}{2}$ times that of the upper. But such is not the case with beams of timber; for although the tenacity of timber be on an average twice that of its resistance to compression, its flexibility is so great, that any considerable length of beam, where columns cannot be situated to its support, requires to be strengthened or trussed by iron rods, as in the following manner.





And these applications of principle not only tend to diminish deflection, but the required purpose is also more effectively attained, and that by lighter pieces of timber.

To ascertain the absolute strength of a cast iron beam of the preceding form, or that of strongest section.

RULE.—Multiply the sectional area of the bottom flange in inches by the depth of the beam in inches, and divide the product by the distance between the supports, also in inches; and 514 times the quotient equal the absolute strength of the beam in cwts.

The strongest form in which any given quantity of matter can be disposed is that of a hollow cylinder; and it has been demonstrated that the maximum of strength is obtained in cast iron, when the thickness of the annulus, or ring, amounts to one-fifth of the cylinder's external diameter; the relative strength of a solid to that of a hollow cylinder being as the diameters of their sections. (*See Tables.*)

A Table showing the Weight or Pressure a beam of Cast Iron, 1 inch in breadth, will sustain, without destroying its elastic force, when it is supported at each end, and loaded in the middle of its length, and also the deflection in the middle which that weight will produce. By Mr. Hodgkinson, Manchester.

Length.	6 feet.		7 feet.		8 feet.		9 feet.		10 feet.	
Depth in in.	Weight in lbs.	Defl. in in.	Weight in lbs.	Defl. in in.	Weight in lbs.	Defl. in in.	Weight in lbs.	Defl. in in.	Weight in lbs.	Defl. in in.
3	1278	.24	1089	.33	954	.426	855	.54	765	.66
3½	1739	.205	1482	.28	1298	.365	1164	.46	1041	.57
4	2272	.18	1936	.245	1700	.32	1520	.405	1360	.5
4½	2875	.16	2450	.217	2146	.284	1924	36	1721	.443
5	3560	.144	3050	.196	2650	.256	2375	.32	2125	.4
6	5112	.12	4356	.163	3816	.213	3420	.27	3060	.33
7	6958	.103	5929	.14	5194	.183	4655	.23	4165	.29
8	9088	.09	7744	.123	6784	.16	6080	203	5440	.25
9			9801	.109	8586	.142	7695	.18	6885	.22
10			12100	.098	10600	.128	9500	.162	8500	.2
11					12826	.117	11495	.15	10285	.182
12					15264	.107	13680	.135	12240	.17
13							16100	.125	14400	.154
14							18600	.115	16700	.143
	12 feet.		14 feet.		16 feet.		18 feet.		20 feet.	
6	2548	·48	2184	.65	1912	.85	1699	1.08	1530	1.34
7	3471	.41	2975	.58	2603	.73	2314	.93	2082	1.14
8	4532	.36	3884	.49	3396	.64	3020	.81	2720	1.00
9	5733	.32	4914	.44	4302	.57	3825	.72	3438	.89
10	7083	.28	6071	.39	5312	.51	4722	.64	4250	.8
11	8570	.26	7346	.36	6428	.47	5714	.59	5142	.73
12	10192	.24	8736	.33	7648	.43	6796	.54	6120	.67
13	11971	.22	10260	.31	8978	.39	7980	.49	7182	.61
14	13883	.21	11900	.28	10412	.36	9255	.46	8330	.57
15	15937	.19	13660	.26	11952	.34	10624	.43	9562	.53
16	18128	.18	15536	.24	13584	.32	12080	.40	10880	.5
17	20500	.17	17500	.23	15353	.30	13647	.38	12282	.47
18	22932	.16	19656	.21	17208	.28	15700	.36	13752	.44

NOTE.—This Table shows the greatest weight that ever ought to be laid upon a beam for permanent load; and, if there be any liability to jerks, &c., ample allowance must be made; also, the weight of the beam itself must be included. (*See Tables of Cast Iron.*)

To find the weight of a cast iron beam of given dimensions.

RULE.—Multiply the sectional area in inches by the length in feet, and by 3.2, the product equal the weight in lbs.

EX. Required the weight of a uniform rectangular beam of cast iron, 16 feet in length, 11 inches in breadth, and 1½ inch in thickness.

$$11 \times 1.5 \times 16 \times 3.2 = 844.8 \text{ lbs.}$$

RESISTANCE OF BODIES TO FLEXURE BY VERTICAL PRESSURE.

When a piece of timber is employed as a column or support, its tendency to yielding by compression is different according to the proportion between its length and area of its cross section; and supposing the form that of a cylinder whose length is less than seven or eight times its diameter, it is impossible to bend it by any force applied longitudinally, as it will be destroyed by splitting before that bending can take place; but when the length exceeds this, the column will bend under a certain load, and be ultimately destroyed by a similar

kind of action to that which has place in the transverse strain. Columns of cast iron and of other bodies are also similarly circumstanced.

When the length of a cast iron column with flat ends equals about thirty times its diameter, fracture will be produced wholly by bending of the material. When of less length, fracture takes place partly by crushing and partly by bending. But, when the column is enlarged in the middle of its length from one and a half to twice its diameter at the ends, by being cast hollow, the strength is greater by one-seventh than in a solid column containing the same quantity of material.

To determine the dimensions of a support or column to bear, without sensible curvature, a given pressure in the direction of its axis.

RULE.—Multiply the pressure to be supported in lbs. by the square of the column's length in feet, and divide the product by twenty times the tabular value of E; and the quotient will be equal to the breadth multiplied by the cube of the least thickness, both being expressed in inches.

NOTE 1.—When the pillar or support is a square, its side will be the fourth root of the quotient.

NOTE 2.—If the pillar or column be a cylinder, multiply the tabular value of E by 12, and the fourth root of the quotient equal the diameter.

EX. 1. What should be the least dimensions of an oak support, to bear a weight of 2240 lbs, without sensible flexure, its breadth being 3 inches, and its length 5 feet?

Tabular value of E = 105,

and $\frac{2240 \times 5^2}{20 \times 105 \times 3} = \sqrt[3]{8.888} = 2.05$ inches.

EX. 2 Required the side of a square piece of Riga fir, 9 feet in length, to bear a permanent weight of 6000 lbs.

Tabular value of E = 96,

and $\frac{6000 \times 9^2}{20 \times 96} = \sqrt[4]{253} = 4$ inches nearly.

ELASTICITY OF TORSION, OR RESISTANCE OF BODIES TO TWISTING.

The angle of flexure by torsion is as the length and extensibility of the body directly and inversely as the diameter; hence, the length of a bar or shaft being given, the power, and the leverage the power acts with, being known, and also the number of degrees of torsion that will not affect the action of the machine, to determine the diameter in cast iron with a given angle of flexure.

RULE.—Multiply the power in lbs. by the length of the shaft in feet, and by the leverage in feet; divide the product by fifty-five times the number of degrees in the angle of torsion; and the fourth root of the quotient equal the shaft's diameter in inches.

EX. Required the diameters for a series of shafts 35 feet in length, and to transmit a power equal to 1245 lbs., acting at the circumference of a wheel 2½ feet radius, so that the twist of the shafts on the application of the power may not exceed one degree.

$$\frac{1245 \times 35 \times 2.5}{55 \times 1} = \sqrt[4]{1981} = 6.67 \text{ inches in diameter.}$$

To determine the side of a square shaft to resist torsion with a given flexure.

RULE.—Multiply the power in pounds by the leverage it acts with in feet, and also by the length of the shaft in feet; divide this product by 92.5 times the angle of flexure in degrees, and the square root of the quotient equals the area of the shaft in inches.

EX. Suppose the length of a shaft to be 12 feet, and to be driven by a power equal to 700 lbs., acting at 1 foot from the centre of the shaft—required the area of cross section, so that it may not exceed 1 degree of flexure.

$$\frac{700 \times 1 \times 12}{92.5 \times 1} = \sqrt[2]{90.8} = 9.53 \text{ inches.}$$

Relative strength of Bodies to resist Torsion, Lead being 1.

Tin 1.4	Gun Metal 5.0	English Iron.....10.1
Copper 4.3	Cast Iron 9.0	Blistered Steel 16 6
Yellow Brass 4.6	Swedish Iron 9.5	Shear Steel 17.0

STRENGTH OF MATERIALS.

[*From Grier's Mechanic's Calculator, &c.*]

BAR OF IRON.—The average breaking weight of a Bar of Wrought Iron, 1 inch square, is 25 tons; its elasticity is destroyed, however, by about two-fifths of that weight, or 10 tons. It is extended, within the limits of its elasticity, .000096, or one-tenthousandth part of an inch for every ton of strain per square inch of sectional area. Hence, the greatest constant load should never exceed one-fifth of its breaking weight, or 5 tons for every square inch of sectional area.

The lateral strength of wrought iron, as compared with cast iron, is as 14 to 9. Mr. Barlow finds that wrought iron bars, 3 inches deep, 1 1-2 inches thick, and 33 inches between the supports, will carry 4 1-2 tons.

BRIDGES.—The greatest extraneous load on a square foot is about 120 pounds.

FLOORS.—The least load on a square foot is about 160 pounds.

ROOFS.—Covered with slate, on a square foot, 51 1-2 pounds.

BEAMS.— When a beam is supported in the middle and loaded at each end, it will bear the same weight as when supported at both ends and loaded in the middle; that is, each end will bear half the weight.

Cast Iron Beams should not be loaded to more than one-fifth of their ultimate strength.

The strength of similar *beams* varies inversely as their lengths; that is, if a beam 10 feet long will support 1000 pounds, a similar beam 20 feet long would support only 500 pounds.

A *beam* supported at one end will sustain only one-fourth part the weight which it would if supported at both ends.

When a *beam* is fixed at both ends, and loaded in the middle, it will bear one-half more than it will when loose at both ends. When the beam is loaded uniformly throughout it will bear double. When the beam is fixed at both ends, and loaded uniformly, it will bear triple the weight.

In any *beam* standing obliquely, or in a sloping direction, its strength or strain will be equal to that of a beam of the same breadth, thickness, and material, but only of the length of the horizontal distance between the points of support.

In the construction of *beams*, it is necessary that their form should be such that they will be equally strong throughout. If a beam be fixed at one end, and loaded at the other, and the breadth uniform throughout its length, then, that the beam may be equally strong throughout, its form must be that of a parabola. This form is generally used in the beams of steam engines.

When a *beam* is regularly diminished towards the points that are least strained, so that all the sections are similar figures, whether it be supported at each end and loaded in the middle, or supported in the middle and loaded at each end, the outline should be a cubic parabola.

When a beam is supported at both ends, and is of the same breadth throughout, then, if the load be uniformly distributed throughout the length of the beam, the line bounding the compressed side should be a semi-ellipse.

The same form should be made use of for the rails of a wagon-way, where they have to resist the pressure of a load rolling over them.

Similar *plates* of the same thickness, either supported at the ends or all round, will carry the same weight either uniformly distributed or laid on similar points, whatever be their extent.

The lateral strength of any *beam*, or *bar* of *wood*, *stone*, *metal*, &c., is in proportion to its breadth multiplied by its depth^2. In square beams the lateral strengths are in proportion to the cubes of the sides, and in general of like-sided beams as the cubes of the similar sides of the section.

The lateral strength of any *beam* or *bar*, one end being fixed in the wall and the other projecting, is inversely as the distance of the weight from the section acted upon; and the strain upon any section is directly as the distance of the weight from that section.

The absolute strength of *ropes* or *bars*, pulled lengthwise, is in proportion to the squares of their diameters. All cylindrical or prismatic rods are equally strong in every part, if they are equally thick, but if not they will break where the thickness is least.

The strength of a *tube*, or *hollow cylinder*, is to the strength of a solid one as the difference between the fourth powers of the exterior and interior diameters of the tube, divided by the exterior diameter, is to the cube of the diameter of a solid cylinder,—the quantity of matter in each being the same. Hence, from this it will be found, that a hollow cylinder is one-half stronger than a solid one having the same weight of material.

The strength of a column to resist being crushed is directly as the square of the diameter, provided it is not so long as to have a chance of bending. This is true in metals or stone, but in timber the proportion is rather greater than the square.

MODELS PROPORTIONED TO MACHINES.

The relation of models to machines, as to strength, deserves the particular attention of the mechanic. A model may be perfectly proportioned in all its parts as a model, yet the machine, if constructed in the same proportion, will not be sufficiently strong in every part; hence, particular attention should be paid to the kind of strain the different parts are exposed to; and from the statements which follow, the proper dimensions of the structure may be determined.

If the strain to draw asunder in the model be 1, and if the structure is 8 times larger than the model, then the stress in the structure will be 8^3 equal 512. If the structure is 6 times as large as the model, then the stress on the structure will be 6^3 equal 216, and so on; therefore, the structure will be much less firm than the model; and this the more, as the structure is cube times greater than the model. If we wish to determine the greatest size we can make a machine of which we have a model, we have,

The greatest weight which the beam of the model can bear, divided by the weight which it actually sustains equal a quotient which, when multiplied by the size of the beam in the model, will give the greatest possible size of the same beam in the structure.

Ex.—If a beam in the model be 7 inches long, and bear a weight of 4 lbs. but is capable of bearing a weight of 26 lbs.; what is the greatest length which we can make the corresponding beam in the structure? Here

$$26 \div 4 = 6{\cdot}5, \qquad \text{therefore, } 6{\cdot}5 \times 7 = 45{\cdot}5 \text{ inches.}$$

The strength to resist crushing, increases from a model to a structure in proportion to their size, but, as above, the strain increases as the cubes; wherefore, in this case, also, the model will be stronger than the machine, and the greatest size of the structure will be found by employing the square root of the quotient in the last rule, instead of the quotient itself; thus,

If the greatest weight which the column in a model can bear is 3 cwt., and if it actually bears 28 lbs., then, if the column be 18 inches high, we have

$$\sqrt{\left(\frac{336}{28}\right)} = 3{\cdot}464; \quad \text{wherefore } 3{\cdot}464 \times 18 = 62{\cdot}352$$

inches, the length of the column in the structure.

STRENGTH OF MATERIALS.

[*From Adcock's Engineer.*]

List of metals, arranged according to their strength.—Steel, wrought-iron, cast-iron, platinum, silver, copper, brass, gold, tin, bismuth, zinc, antimony, lead.

According to Tredgold's and Duleau's experiments, a piece of the best bar-iron 1 square inch across the end would bear a weight of about 77,373 lbs., while a similar piece of cast-iron would be torn asunder by a weight of from 16,243 to 19,464 lbs. Thin iron wires, arranged parallel to each other, and presenting a surface at their extremity of 1 square inch, will carry a mean weight of 126,340 lbs.

List of woods, arranged according to their strength.—Oak, alder, lime, box, pine (*sylv.*), ash, elm, yellow pine, fir.

A piece of well-dried pine wood, presenting a section of 1 square inch, is able, according to Eytelwein, to support a weight of from 15,646 lbs. to 20,408 lbs., whilst a similar piece of oak will carry as much as 25,850 lbs.

Hempen cords, twisted, will support the following weights to the *square inch* of their section:

¼-inch to 1 inch thick, 8,746 lbs.; 1 to 3 inches thick, 6,800 lbs.; 3 to 5 inches thick, 5,345 lbs.; 5 to 7 inches thick, 4,860 lbs.

Tredgold gives the following rule for finding the weight in lbs. which a hempen rope will be capable of supporting: Multiply the square of the circumference in inches by 200, and the product will be the quantity sought.

In the practical application of these measures of absolute strength, that of metals should be reckoned at one-half, and that of woods and cords at one-third of their estimated value.

In a parallelopipedon of uniform thickness, supported on two points and loaded in the middle, *the lateral strength is directly as the product of the breadth into the square of the depth, and inversely as the length.* Let W represent the lateral strength of any material, estimated by the weight, b the breadth, and d the depth of its end, and l the distance between the points of support; then $W = fd^2b \div l$.

If the parallelopipedon be fastened only at one end in a horizontal position, and the load be applied at the opposite end, $W = fd^2b \div 4l$.

It is to be observed that the three dimensions, b, d, and l, are to be taken in the same measure, and that b be so great that no lateral curvature arise from the weight; f in each formula represents the lateral strength, which varies in different materials, and which must be learnt experimentally.

A beam having a rectangular end, whose breadth is two or three times greater than the breadth of another beam, has a power of suspension respectively two or three times greater than it; if the end be two or three times deeper than the end of the other, the suspension power of that which has the greater depth exceeds the suspension power of the other, four or nine times; if its length be two or three times greater than the length of another beam, its power of suspension will be ½ or 1-3 respectively that of the other; provided that in each case the mode of suspension, the position of the weight, and other circumstances be similar. Hence it follows that a beam, one of whose sides tapers, has a greater power of suspension if placed on the slant than on the broad side, and that the powers of suspension in both cases are in the ratio of their sides; so, for instance, a beam, one of whose sides is double the width of the other, will carry twice as much if placed on the narrow side, as it would if laid on the wide one.

In a piece of round timber (a cylinder) the power of suspension is in proportion to the diameters cubed, and inversely as the length; thus a beam with a diameter two or three times longer than that of another, will carry a weight 8 or 27 times heavier respectively than that whose diameter is unity, the mode of fastening and loading it being similar in both cases.

The lateral strength of square timber is to that of a tree whence it is hewn as 10 : 17 nearly.

A considerable advantage is frequently secured by using hollow cylinders instead of solid ones, which, with an equal expenditure of materials, have far greater strength, provided only that the solid part of the cylinder be of a sufficient thickness, and that the workmanship be good; especially that in cast metal beams the thickness be uniform, and the metal free from flaws. According to Eytelwein, such hollow cylinders are to solid ones of equal weight of metal as 1.212 : 1, when the inner semi-diameter is to the outer as 1 : 2; according to Tredgold as 17 : 10, when the two semi-diameters are to each other as 15 : 25, and as 2 : 1, when they are to each other as 7 : 10.

A method of increasing the suspensive power of timber supported at both ends, is, to saw down from ¼ to ½ of its depth, and forcibly drive in a wedge of metal or hard wood, until the timber is slightly raised at the middle out of the horizontal line. By experiment it was found that the suspensive power of a beam thus cut 1-3 of its depth was increased 1-19th, when cut ¼ it was increased 1-29th, and when cut 3-4th through it was increased 1-87th.

The force required to crush a body increases as the section of the body increases; and this quantity being constant, the resistance of the body diminishes as the height increases.

According to Eytelwein's experiments, the strength of columns or timbers of rectangular form in resisting compression is, as

1. The cube of their thickness (the lesser dimension of their section). 2. As the breadth (the greater dimension of their section). 3. inversely as the square of their length.

Cohesive power of Bars of Metal one inch square, in Tons.

Iron, Swedish bar.	29.20	Copper, wrought . . .	15.08
Do., Russian bar	26.70	Gun metal	16.23
Do., English bar	25.00	Copper, cast	8.51
Steel, cast	59.93	Brass, cast, yellow . . .	8.01
Do., blistered	59.43	Iron, cast	7.87
Do., sheer	56.97	Tin, cast	2.11

RELATIVE STRENGTH OF CAST AND MALLEABLE IRON.

It has been found, in the course of the experiments made by Mr. Hodgkinson and Mr. Fairbairn, that the average strain that cast iron will bear in the way of tension, before breaking, is about seven tons and a half per square inch; the weakest, in the course of 16 trials on various descriptions, bearing 6 tons, and the strongest 9 3-4 tons. The experiments of Telford and Brown show that malleable iron will bear, on an average, 27 tons; the weakest bearing 24, and the strongest 29 tons. On approaching the breaking point, cast iron may snap in an instant, without any previous symptom, while wrought iron begins to stretch, with half its breaking weight, and so continues to stretch till it breaks. The experiments of Hodgkinson and Fairbairn show also that cast iron is capable of sustaining compression to the extent of nearly 50 tons on the square inch; the weakest bearing 36½ tons, and the strongest 60 tons. In this respect, malleable iron is much inferior to cast iron. With 12 tons on the square inch it yields, contracts in length, and expands laterally; though it will bear 27 tons, or more, without actual fracture.

Rennie states that cast iron may be crushed with a weight of 93,000 lbs., and brick with one of 562 lbs. on the square inch.

COMPARATIVE WEIGHT OF CURVED CORRUGATED ROOFS.

In London and Liverpool.

The entire weight per square, of a curved corrugated roof, from 30 to 40 ft. span, is about 2¼ cwt. If 40 to 60 ft. span, is about 3 cwt.

The entire cost per square of a roof of curved corrugated galvanized metal, 30 to 40 ft. span, will be 4*l.* 10*s.* to 5*l.* If 40 to 60 ft. 5*l.* 5*s* to 6*l.* 6*s.*

Roofs of smaller span may be constructed in this way at a very moderate rate, even as low as 3*l.* per square.

From the above statement of the weight of this description of roof it will be apparent that the curved galvanized metal is applicable where the heavier kinds of roofing cannot be used. This material has also the additional advantage of being fire-proof.

Corrugated galvanized metal in this form has, we understand, been used with advantage for lining the arches of several railway tunnels where there was a considerable drip of water.

Another mode of covering roofs, where simplicity is desirable in consequence of skilled labor not being easily obtained, has been patented by Morewood and Rogers, the patentees of Galvanized Tinned Iron, and consists in stamping their sheets into large tiles, which are fastened by simply nailing them to wooden framework or common boarding.

These tiles are very suitable for export, as they pack closely into each other, occupy but little space, and protect one another from injury.

When galvanized metal is used, a lighter gauge may be employed with safety than if the covering material were of ordinary iron, on account of the non-liability of galvanized metal to decay.

But if this covering be adopted in large manufacturing towns, or where it is exposed to acid vapors, or coal smoke containing much sulphur, we should deem it well to take the precaution of giving it a coat of paint, which effectually shields the surface from the action of the aqueous acid, while the galvanizing prevents the iron from rusting, and so throwing off the paint, as is the case with common iron.

Galvanized tinned iron rain-water tube, piping, gutter, and gas and water tubing, also possess great advantage over uncoated iron or lead — over the former on account of their durability, lightness, and appearance; and over the latter on account of their being less liable to get out of order, and their innoxious qualities, if the water which passes through the tubes or gutter be afterwards used for drinking purposes.

Gauges and Weights of Galvanized Tinned Iron Sheets.

Size.	No. Wire Gauge.	Weight per Square ft.	Price of Galvanized Tinned Iron, per Ton.	Price of "Best" Galvanized Tinned Iron, per Ton.
			£ s. d.	£ s. d.
6 ft. × 2 ft.	12	about 72 oz.	22 10 0	26 0 0
"	14	" 56 "	22 10 0	26 0 0
"	16	" 40 "	22 10 0	26 0 0
"	18	" 34 "	24 0 0	27 10 0
"	20	" 26 "	25 10 0	29 0 0
"	22	" 21 "	29 0 0	32 10 0
"	24	" 17 "	29 0 0	32 10 0
"	26	" 15 "	32 10 0	36 0 0
"	28	" 12 "	35 10 0	39 0 0
4 ft. × 20 in.	30	" 10 "	...	48 0 0
"	32	" 9 "	...	53 0 0

MECHANICAL TABLES

FOR THE USE OF OPERATIVE SMITHS, MILLWRIGHTS, AND ENGINEERS.

The following Tables, originally dedicated to 'the National Association of the Forgers of Iron Work,' England, by JAMES FODEN, *will be found extremely useful to Smiths, generally, and are accompanied by Practical Examples.*— TEMPLETON.

DIAMETERS AND CIRCUMFERENCES OF CIRCLES.

Diam.	Circ.		Diam.	Circ.		Diam.	Circ.		Diam.	Circ.		Diam	Circ.	
In.	Ft.	In.	In.	Ft.	In.	Ft. In.	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.
1	0	3⅛	5⅛	1	5¼	0 10	2	7⅝	1	2⅝	3	9¼	1	6⅛	4	11¼
1⅛	0	3½	5⅜	1	5⅝				1	2¾	3	9½	1	7	4	11⅝
1¼	0	3⅞	5½	1	6	0 10⅛	2	7¾	1	2⅞	3	9¾				
1⅜	0	4¼	5⅝	1	6⅛	0 10¼	2	8⅛	1	2¾	3	10¼	1	7⅛	5	0
1½	0	4⅜	6	1	6¼	0 10⅜	2	8¼	1	2⅞	3	10⅜	1	7¼	5	0⅛
1⅝	0	5				0 10½	2	8⅞	1	3	3	11	1	7⅜	5	0⅜
1¾	0	5⅛	6⅛	1	7⅛	0 10⅝	2	9⅛					1	7½	5	1¼
1⅞	0	5⅞	6¼	1	7⅜	0 10¾	2	9¼	1	3⅛	3	11½	1	7⅝	5	1⅜
2	0	6¼	6⅜	1	8	0 10⅞	2	10⅛	1	3¼	3	11⅝	1	7¾	5	2
			6½	1	8⅛	0 11	2	10¼	1	3⅜	4	0¼	1	7⅞	5	2⅛
2⅛	0	6⅝	6⅝	1	8¼				1	3½	4	0⅝	1	8	5	2¼
2¼	0	7	6¾	1	9¼	0 11⅛	2	10⅞	1	3⅝	4	1				
2⅜	0	7⅛	6⅞	1	9½	0 11¼	2	11¼	1	3¾	4	1⅜	1	8⅛	5	3⅛
2½	0	7¼	7	1	9⅝	0 11⅜	2	11⅜	1	3⅞	4	1⅞	1	8¼	5	3⅜
2⅝	0	8⅛				0 11½	3	0	1	4	4	2¼	1	8⅜	5	4
2¾	0	8⅜	7⅛	1	10⅜	0 11⅝	3	0½					1	8½	5	4⅛
2⅞	0	9	7¼	1	10¾	0 11¾	3	0⅞	1	4⅛	4	2⅝	1	8⅝	5	4¼
3	0	9⅜	7⅜	1	11⅛	0 11⅞	3	1¼	1	4¼	4	3	1	8¾	5	5⅛
			7½	1	11½	1 0	3	1⅜	1	4⅜	4	3⅜	1	8⅞	5	5½
3⅛	0	9¾	7⅝	1	11⅞				1	4½	4	3¾	1	9	5	5⅞
3¼	0	10⅛	7¾	2	0¼	1 0⅛	3	2	1	4⅝	4	4⅛				
3⅜	0	10½	7⅞	2	0⅜	1 0¼	3	2⅛	1	4¾	4	4½	1	9⅛	5	6⅛
3½	0	10⅞	8		1⅛	1 0⅜	3	2¼	1	4⅞	4	5	1	9¼	5	6¼
3⅝	0	11⅜				1 0½	3	3¼	1	5	4	5⅛	1	9⅜	5	7⅛
3¾	0	11⅝	8⅛	2	1¼	1 0⅝	3	3⅜					1	9½	5	7½
3⅞	1	0⅛	8¼	2	1⅜	1 0¾	3	4	1	5⅛	4	5¼	1	9⅝	5	8
4	1	0½	8⅜	2	2¼	1 0⅞	3	4⅛	1	5¼	4	6⅛	1	9¾	5	8⅛
			8½	2	2⅛	1 1	3	4¼	1	5⅜	4	6¼	1	9⅞	5	8¼
4⅛	1	0⅞	8⅝	2	3				1	5½	4	6⅜	1	10	5	9
4¼	1	1¼	8¾	2	3⅛	1 1⅛	3	5⅛	1	5⅝	4	7⅛				
4⅜	1	1⅝	8⅞	2	3⅜	1 1¼	3	5⅜	1	5¾	4	7¼	1	10⅛	5	9¼
4½	1	2⅛	9	2	4¼	1 1⅜	3	6	1	5⅞	4	8⅛	1	10¼	5	9⅞
4⅝	1	2½				1 1½	3	6⅛	1	6	4	8½	1	10⅜	5	10¼
4¾	1	2⅞	9⅛	2	4⅝	1 1⅝	3	6¼					1	10½	5	10⅜
4⅞	1	3¼	9¼	2	5	1 1¾	3	7⅛	1	6⅛	4	8⅞	1	10⅝	5	11
5	1	3⅜	9⅜	2	5⅛	1 1⅞	3	7⅜	1	6¼	4	9¼	1	10¾	5	11⅛
			9½	2	5¼	1 2	3	7½	1	6⅜	4	9⅜	1	10⅞	5	11¼
5⅛	1	4	9⅝	2	6⅛				1	6½	4	10	1	11	6	0¼
5¼	1	4⅛	9¾	2	6⅛	1 2⅛	3	8⅛	1	6⅝	4	10⅛				
5⅜	1	4⅞	9⅞	2	7	1 2¼	3	8¼	1	6¾	4	10⅜	1	11⅛	6	0⅜

Diam.		Circ.		Diam.		Circ.		Diam.		Circ.		Diam.		Circ.		Diam.		Circ.	
Ft.	In.	Ft.	In.	Ft.	In.	Ft.	in.	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.
1	11¼	6	1	2	4⅞	7	6⅝	2	10⅜	8	11⅞	3	4	10	5⅝	3	9¼	11	10⅞
1	11⅜	6	1⅛	2	5	7	7	2	10½	9	0⅛					3	9⅜	11	11¼
1	11½	6	1¼					2	10⅝	9	0¼	3	4⅛	10	6	3	9½	11	11⅝
1	11⅝	6	2⅛	2	5⅛	7	7⅛	2	10¾	9	1⅛	3	4¼	10	6⅜	3	9⅞	12	0
1	11¾	6	2¼	2	5⅜	7	7¼	2	10⅞	9	1½	3	4⅜	10	6½	3	10	12	0⅛
1	11⅞	6	3	2	5⅝	7	8⅛	2	11	9	1⅞	3	4½	10	7⅛				
2	0	6	3⅛	2	5½	7	8⅜					3	4⅝	10	7⅜	3	10⅛	12	0⅜
				2	5⅝	7	9	2	11⅛	9	2⅛	3	4¾	10	8	3	10¼	12	1⅜
2	0⅛	6	3¼	2	5¾	7	9⅜	2	11¼	9	2⅜	3	4⅞	10	8⅜	3	10⅜	12	1⅝
2	0¼	6	4⅛	2	5⅞	7	9¾	2	11⅜	9	3	3	5	10	8¾	3	10½	12	2
2	0⅜	6	4¼	2	6	7	10⅛	2	11½	9	3½					3	10⅝	12	2⅛
2	0½	6	4⅜					2	11⅝	9	3⅞	3	5⅛	10	9⅛	3	10¾	12	2⅜
2	0⅝	6	5⅛	2	6⅛	7	10⅜	2	11¾	9	4¼	3	5¼	10	9½	3	10⅞	12	2½
2	0¾	6	5¼	2	6¼	7	11	2	11⅞	9	4⅝	3	5⅜	10	9⅞	3	11	12	3⅛
2	0⅞	6	6⅛	2	6⅜	7	11⅛	3	0	9	5	3	5½	10	10⅛				
2	1	6	6¼	2	6½	7	11¼					3	5⅝	10	10¼	3	11⅛	12	4
				2	6⅝	8	0⅛	3	0⅛	9	5⅜	3	5¾	10	10⅜	3	11¼	12	4⅛
2	1⅛	6	6⅞	2	6¾	8	0⅜	3	0¼	9	5½	3	5⅞	10	10½	3	11⅜	12	4¼
2	1¼	6	7⅛	2	6⅞	8	0½	3	0⅜	9	5⅝	3	6	10	10⅝	3	11½	12	4⅜
2	1⅜	6	7¼	2	7	8	0⅝	3	0½	9	5¾					3	11⅝	12	4½
2	1½	6	7⅜	2	7⅛	8	0¾	3	0⅝	9	6	3	6⅛	10	10¾	3	11¾	12	4⅝
2	1⅝	6	7½	2	7¼	8	0⅞	3	0¾	9	6⅛	3	6¼	10	10⅞	3	11⅞	12	4¾
2	1¾	6	7⅝	2	7⅜	8	1	3	0⅞	9	6¼	3	6⅜	11	0	4	0	12	4⅞
2	1⅞	6	7¾	2	7½	8	1⅛	3	1	9	6⅜	3	6½	11	0⅛				
2	2	6	7⅞	2	7⅝	8	1¼					3	6⅝	11	0¼	4	0⅛	12	5
				2	7¾	8	1⅜	3	1⅛	9	6½	3	6¾	11	0⅜	4	0¼	12	5⅛
2	2⅛	6	8	2	7⅞	8	1½	3	1¼	9	6⅝	3	6⅞	11	0½	4	0⅜	12	5¼
2	2¼	6	8⅛	2	8	8	1⅝	3	1⅜	9	6¾	3	7	11	0⅝	4	0½	12	5⅜
2	2⅜	6	8¼	2	8⅛	8	1¾	3	1½	9	6⅞					4	0⅝	12	5½
2	2½	6	8⅜	2	8¼	8	1⅞	3	1⅝	9	7	3	7⅛	11	0¾	4	0¾	12	5⅝
2	2⅝	6	8½	2	8⅜	8	2	3	1¾	9	7⅛	3	7¼	11	0⅞	4	0⅞	12	5¾
2	2¾	6	8⅝	2	8½	8	2⅛	3	1⅞	9	7¼	3	7⅜	11	1	4	1	12	5⅞
2	2⅞	6	8¾	2	8⅝	8	2¼	3	2	9	7⅜	3	7½	11	1⅛				
2	3	6	8⅞	2	8¾	8	2⅜					3	7⅝	11	1¼	4	1⅛	12	6
				2	8⅞	8	2½	3	2⅛	9	7½	3	7¾	11	1⅜	4	1¼	12	6⅛
2	3⅛	7	0	2	9	8	2⅝	3	2¼	9	7⅝	3	7⅞	11	1½	4	1⅜	12	6¼
2	3¼	7	0⅛					3	2⅜	9	7¾	3	8	11	1⅝	4	1½	12	6⅜
2	3⅜	7	0¼	2	9⅛	8	2¾	3	2½	9	7⅞					4	1⅝	12	6½
2	3½	7	0⅜	2	9¼	8	2⅞	3	2⅝	9	8	3	8⅛	11	1¾	4	1¾	12	6⅝
2	3⅝	7	0½	2	9⅜	8	3	3	2¾	9	8⅛	3	8¼	11	1⅞	4	1⅞	12	6¾
2	3¾	7	0⅝	2	9½	8	3⅛	3	2⅞	9	8¼	3	8⅜	11	2	4	2	12	6⅞
2	3⅞	7	0¾	2	9⅝	8	3¼	3	3	9	8⅜	3	8½	11	2⅛				
2	4	7	0⅞	2	9¾	8	3⅜					3	8⅝	11	2¼	4	2⅛	12	7
				2	9⅞	8	3½	3	3⅛	9	8½	3	8¾	11	2⅜	4	2¼	12	7⅛
2	4⅛	7	1	3	0	8	3⅝	3	3¼	9	8⅝	3	8⅞	11	2½	4	2⅜	12	7¼
2	4¼	7	1⅛	3	0⅛	8	3¾	3	3⅜	9	8¾	3	9	11	2⅝	4	2½	12	7⅜
2	4⅜	7	1¼	3	0¼	8	3⅞	3	3½	9	8⅞					4	2⅝	12	7½
2	4½	7	1⅜	3	0⅜	8	4	3	3⅝	9	9	3	9⅛	11	2¾	4	2¾	12	7⅝
2	4⅝	7	1½	3	0½	8	4⅛	3	3¾	9	9⅛	3	9¼	11	2⅞	4	2⅞	12	7¾
2	4¾	7	1⅝	3	0⅝	8	4¼	3	3⅞	9	9¼	3	9⅜	11	3	4	3	12	7⅞
2	4⅞	7	1¾	3	0¾	8	4⅜	3	4	9	9⅜								
2	5	7	1⅞	3	0⅞	8	4½												
2	5⅛	7	2	3	1	8	4⅝												
2	5¼	7	2⅛	3	1⅛	8	4¾												
2	5⅜	7	2¼	3	1¼	8	4⅞												
2	5½	7	2⅜	3	1⅜	8	5												
2	5⅝	7	2½	3	1½	8	5⅛												
2	5¾	7	2⅝	3	1⅝	8	5¼												
2	5⅞	7	2¾	3	1¾	8	5⅜												
2	6	7	2⅞	3	1⅞	8	5½												
2	6⅛	7	3	3	2	8	5⅝												
2	6¼	7	3⅛	3	2⅛	8	5¾												
2	6⅜	7	3¼	3	2¼	8	5⅞												
2	6½	7	3⅜	3	2⅜	8	6												
2	6⅝	7	3½	3	2½	8	6⅛												
2	6¾	7	3⅝	3	2⅝	8	6¼												
2	6⅞	7	3¾	3	2¾	8	6⅜												
2	7	7	3⅞	3	2⅞	8	6½												
2	7⅛	7	4	3	3	8	6⅝												
2	7¼	7	4⅛	3	3⅛	8	6¾												
2	7⅜	7	4¼	3	3¼	8	6⅞												
2	7½	7	4⅜	3	3⅜	8	7												
2	7⅝	7	4½	3	3½	8	7⅛												
2	7¾	7	4⅝	3	3⅝	8	7¼												
2	7⅞	7	4¾	3	3¾	8	7⅜												
2	8	7	4⅞	3	3⅞	8	7½												
2	8⅛	7	5	3	4	8	7⅝												
2	8¼	7	5⅛	3	4⅛	8	7¾												
2	8⅜	7	5¼	3	4¼	8	7⅞												
2	8½	7	5⅜	3	4⅜	8	8												
2	8⅝	7	5½	3	4½	8	8⅛												
2	8¾	7	5⅝	3	4⅝	8	8¼												
2	8⅞	7	5¾	3	4¾	8	8⅜												
2	9	7	5⅞	3	4⅞	8	8½												
2	9⅛	7	6	3	5	8	8⅝												
2	9¼	7	6⅛	3	5⅛	8	8¾												
2	9⅜	7	6¼	3	5¼	8	8⅞												
2	9½	7	6⅜	3	5⅜	8	9												
2	9⅝	7	6½	3	5½	8	9⅛												
2	9¾	7	6⅝	3	5⅝	8	9¼												
2	9⅞	7	6¾	3	5¾	8	9⅜												
2	10	7	6⅞	3	5⅞	8	9½												
2	10⅛	7	7	3	6	8	9⅝												
2	10¼	7	7⅛	3	6⅛	8	9¾												
2	10⅜	7	7¼	3	6¼	8	9⅞												
2	10½	7	7⅜	3	6⅜	8	10												
2	10⅝	7	7½	3	6½	8	10⅛												
2	10¾	7	7⅝	3	6⅝	8	10¼												
2	10⅞	7	7¾	3	6¾	8	10⅜												
2	11	7	7⅞	3	6⅞	8	10½												
2	11⅛	7	8	3	7	8	10⅝												
2	11¼	7	8⅛	3	7⅛	8	10¾												
2	11⅜	7	8¼	3	7¼	8	10⅞												
2	11½	7	8⅜	3	7⅜	8	11												
2	11⅝	7	8½	3	7½	8	11⅛												
2	11¾	7	8⅝	3	7⅝	8	11¼												
2	11⅞	7	8¾	3	7¾	8	11⅜												
3	0	7	8⅞	3	7⅞	8	11½												

Diam.		Circ.		Diam.		Circ.		Diam.		Circ.		Diam.		Circ.		Diam.		Circ.	
Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	in.	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.
4	3 1/8	13	4 1/8	4	8 1/8	14	10 1/8	5	2 1/8	16	3 1/8	5	7 1/8	17	9 1/8	6	1 3/8	19	2 1/8
4	3 1/4	13	5	4	8 7/8	14	10 5/8	5	2 3/8	16	3 7/8	5	8	17	9 5/8	6	1 1/2	19	2 7/8
4	3 3/8	13	5 1/8	4	9	14	11	5	2 1/2	16	4 1/8					6	1 5/8	19	3 1/4
4	3 1/2	13	5 1/4					5	2 5/8	16	4 3/8	5	8 1/8	17	10	6	1 3/4	19	3 3/8
4	3 5/8	13	6 1/8	4	9 1/8	14	11 3/8	5	2 1/4	16	5 1/8	5	8 1/4	17	10 3/8	6	1 7/8	19	4
4	3 3/4	13	6 1/4	4	9 1/4	14	11 1/2	5	2 7/8	16	5 1/2	5	8 3/8	17	10 1/2	6	2	19	4 1/8
4	3 7/8	13	6 7/8	4	9 3/8	15	0 1/8	5	3	16	5 7/8	5	8 1/2	17	11 1/8				
4	4	13	7 1/4	4	9 1/2	15	0 3/8					5	8 5/8	17	11 1/2	6	2 1/8	19	4 1/4
				4	9 5/8	15	1	5	3 1/8	16	6 1/4	5	8 3/4	17	11 7/8	6	2 1/4	19	5 1/4
4	4 1/8	13	7 3/8	4	9 3/4	15	1 3/8	5	3 1/4	16	6 3/8	5	8 7/8	18	0 1/8	6	2 3/8	19	5 5/8
4	4 1/4	13	8 1/8	4	9 7/8	15	1 1/2	5	3 3/8	16	7	5	9	18	0 1/4	6	2 1/2	19	6
4	4 3/8	13	8 1/4	4	10	15	2 1/8	5	3 1/2	16	7 1/8					6	2 5/8	19	6 3/8
4	4 1/2	13	8 7/8					5	3 5/8	16	7 7/8	5	9 1/8	18	1 1/8	6	2 3/4	19	6 7/8
4	4 5/8	13	9 1/4	4	10 1/8	15	2 1/2	5	3 3/4	16	8 1/4	5	9 1/4	18	1 1/2	6	2 7/8	19	7 1/8
4	4 3/4	13	9 3/8	4	10 1/4	15	2 7/8	5	3 7/8	16	8 5/8	5	9 3/8	18	1 7/8	6	3	19	7 1/4
4	4 7/8	13	10	4	10 3/8	15	3 1/4	5	4	16	9	5	9 1/2	18	2 1/4				
4	5	13	10 1/2	4	10 1/2	15	3 1/2					5	9 5/8	18	2 5/8	6	3 1/8	19	8
				4	10 5/8	15	4 1/8	5	4 1/8	16	9 5/8	5	9 3/4	18	3	6	3 1/4	19	8 1/8
4	5 1/8	13	10 7/8	4	10 3/4	15	4 1/2	5	4 1/4	16	9 3/4	5	9 7/8	18	3 1/8	6	3 3/8	19	8 1/4
4	5 1/4	13	11 1/4	4	10 7/8	15	4 7/8	5	4 3/8	16	10 1/8	5	10	18	3 7/8	6	3 1/2	19	9 1/8
4	5 3/8	13	11 1/2	4	11	15	5 1/4	5	4 1/2	16	10 1/2					6	3 5/8	19	9 1/2
4	5 1/2	14	0					5	4 5/8	16	11	5	10 1/8	18	4 1/4	6	3 3/4	19	9 7/8
4	5 5/8	14	0 3/8	4	11 1/8	15	5 5/8	5	4 3/4	16	11 3/8	5	10 1/4	18	4 5/8	6	3 7/8	19	10 1/8
4	5 3/4	14	0 7/8	4	11 1/4	15	6 1/8	5	4 7/8	16	11 3/4	5	10 3/8	18	5	6	4	19	10 1/4
4	5 7/8	14	1 1/8	4	11 3/8	15	6 1/2	5	5	17	0 1/8	5	10 1/2	18	5 3/8				
4	6	14	1 3/8	4	11 1/2	15	6 7/8					5	10 5/8	18	5 7/8	6	4 1/8	19	11 1/8
				4	11 5/8	15	7 1/4	5	5 1/8	17	0 3/8	5	10 3/4	18	6 1/4	6	4 1/4	19	11 1/2
4	6 1/8	14	2	4	11 3/4	15	7 5/8	5	5 1/4	17	1	5	10 7/8	18	6 5/8	6	4 3/8	19	11 7/8
4	6 1/4	14	2 3/8	4	11 7/8	15	8	5	5 3/8	17	1 1/8	5	11	18	7	6	4 1/2	20	0 1/4
4	6 3/8	14	2 1/4	5	0	15	8 3/8	5	5 1/2	17	1 1/4					6	4 5/8	20	0 5/8
4	6 1/2	14	3 1/8					5	5 5/8	17	2 1/8	5	11 1/8	18	7 3/8	6	4 3/4	20	1
4	6 5/8	14	3 1/2	5	0 1/8	15	8 7/8	5	5 1/4	17	2 1/2	5	11 1/4	18	7 1/2	6	4 7/8	20	1 1/2
4	6 3/4	14	4	5	0 1/4	15	9 1/4	5	5 7/8	17	2 7/8	5	11 3/8	18	8 1/8	6	5	20	1 7/8
4	6 7/8	14	4 3/8	5	0 3/8	15	9 5/8	5	6	17	3 1/4	5	11 1/2	18	8 1/2				
4	7	14	4 1/2	5	0 1/2	15	10					5	11 5/8	18	9	6	5 1/8	20	2 1/4
				5	0 5/8	15	10 3/8	5	6 1/8	17	3 5/8	5	11 3/4	18	9 3/8	6	5 1/4	20	2 5/8
4	7 1/8	14	5 1/8	5	0 3/4	15	10 1/2	5	6 1/4	17	4 1/8	5	11 7/8	18	9 3/4	6	5 3/8	20	3
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4	7 3/8	14	5 7/8	5	1	15	11 1/2	5	6 1/2	17	4 7/8					6	5 5/8	20	3 1/2
4	7 1/2	14	6 1/4					5	6 5/8	17	5 1/4	6	0 1/4	18	10 1/2	6	5 3/4	20	4 1/4
4	7 5/8	14	6 3/8	5	1 1/8	16	0	5	6 3/4	17	5 5/8	6	0 1/2	18	10 7/8	6	5 7/8	20	4 5/8
4	7 3/4	14	7 1/8	5	1 1/4	16	0 3/8	5	6 7/8	17	6	6	0 3/4	18	11 1/4	6	6	20	5
4	7 7/8	14	7 1/2	5	1 3/8	16	0 1/2	5	7	17	6 1/8	6	0 1/2	18	11 1/2				
4	8	14	7 5/8	5	1 1/2	16	1 1/8					6	0 5/8	19	0 1/8	6	6 1/8	20	5 1/8
				5	1 5/8	16	1 1/2	5	7 1/8	17	6 1/4	6	0 3/4	19	0 1/2	6	6 1/4	20	5 1/2
4	8 1/8	14	8 1/8	5	1 3/4	16	1 7/8	5	7 1/4	17	7 1/8	6	0 7/8	19	0 5/8	6	6 3/8	20	6 1/8
4	8 1/4	14	8 5/8	5	1 7/8	16	2 1/8	5	7 3/8	17	7 5/8	6	1	19	1 1/8	6	6 1/2	20	6 1/2
4	8 3/8	14	9	5	2	16	2 1/4	5	7 1/2	17	8					6	6 5/8	20	7
4	8 1/2	14	9 1/2					5	7 5/8	17	8 3/8	6	1 1/8	19	1 5/8	6	6 3/4	20	7 3/8
4	8 5/8	14	9 7/8	5	2 1/8	16	2 1/2	5	7 3/4	17	8 1/4	6	1 1/4	19	2	6	6 7/8	20	7 1/4

Diam.		Circ.		Diam.		Circ.		Diam.		Circ.		Diam.		Circ.		Diam.		Circ.	
Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.
6	7	20	8 1/8	7	0 1/2	22	1 3/8	7	6 1/8	23	7 1/8	7	11 3/4	25	0 3/4	8	5 1/4	26	6
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6	7 1/8	20	8 1/2	7	0 3/4	22	2 1/4	7	6 3/8	23	7 5/8	8	0	25	1 1/2	8	5 1/2	26	6 1/4
6	7 1/4	20	8 7/8	7	0 7/8	22	2 5/8	7	6 1/2	23	8 1/4					8	5 5/8	26	7 1/4
6	7 3/8	20	9 1/4	7	1	22	3	7	6 5/8	23	8 5/8	8	0 1/8	25	1 7/8	8	5 3/4	26	7 3/8
6	7 1/2	20	9 3/8					7	6 3/4	23	9	8	0 1/4	25	2 1/8	8	5 7/8	26	8
6	7 5/8	20	10 1/8	7	1 1/8	22	3 3/8	7	6 7/8	23	9 3/8	8	0 3/8	25	2 1/4	8	6	26	8 1/8
6	7 3/4	20	10 1/2	7	1 1/4	22	3 1/2	7	7	23	9 7/8	8	0 1/2	25	2 3/8				
6	7 7/8	20	10 7/8	7	1 3/8	22	4 1/8					8	0 5/8	25	3 1/4	8	6 1/8	26	8 1/4
6	8	20	11 1/4	7	1 1/2	22	4 1/2	7	7 1/8	23	10 1/4	8	0 1/2	25	3 7/8	8	6 1/4	26	9 1/8
				7	1 5/8	22	5	7	7 1/4	23	10 3/8	8	0 7/8	25	4 1/2	8	6 3/8	26	9 1/2
6	8 1/8	20	11 5/8	7	1 3/4	22	5 1/8	7	7 3/8	23	11	8	1	25	4 5/8	8	6 1/2	26	10
6	8 1/4	21	0	7	1 7/8	22	5 1/4	7	7 1/2	23	11 3/8					8	6 5/8	26	10 1/8
6	8 3/8	21	0 1/2	7	2	22	6 1/8	7	7 5/8	23	11 3/4	8	1 1/8	25	5 1/8	8	6 3/4	26	10 1/4
6	8 1/2	21	0 7/8					7	7 3/4	24	0 1/8	8	1 1/4	25	5 1/4	8	6 7/8	26	11 3/8
6	8 5/8	21	1 1/4	7	2 1/8	22	6 1/4	7	7 7/8	24	0 1/2	8	1 3/8	25	5 7/8	8	7	26	11 1/2
6	8 3/4	21	1 5/8	7	2 1/4	22	6 3/8	7	8	24	1	8	1 1/2	25	6 1/4				
6	8 7/8	21	2	7	2 3/8	22	7 1/8					8	1 5/8	25	6 1/8	8	7 1/8	26	11 7/8
6	9	21	2 3/8	7	2 1/2	22	7 1/4	7	8 1/8	24	1 3/8	8	1 3/4	25	7	8	7 1/4	27	0 1/4
				7	2 5/8	22	7 3/8	7	8 1/4	24	1 1/2	8	1 7/8	25	7 1/8	8	7 3/8	27	0 1/2
6	9 1/8	21	2 7/8	7	2 3/4	22	8 1/8	7	8 3/8	24	2 1/8	8	2	25	7 1/8	8	7 1/2	27	1 1/8
6	9 1/4	21	3 1/4	7	2 7/8	22	8 1/4	7	8 1/2	24	2 1/4					8	7 5/8	27	1 1/4
6	9 3/8	21	3 5/8	7	3	22	9 1/4	7	8 5/8	24	2 7/8	8	2 1/8	25	8 1/4	8	7 3/4	27	1 7/8
6	9 1/2	21	4					7	8 3/4	24	3 1/8	8	2 1/4	25	8 3/8	8	7 7/8	27	2 1/4
6	9 5/8	21	4 3/8	7	3 1/8	22	9 5/8	7	8 7/8	24	3 3/8	8	2 3/8	25	9	8	8	27	2 3/8
6	9 3/4	21	4 7/8	7	3 1/4	22	10	7	9	24	4 1/8	8	2 1/2	25	9 3/8				
6	9 7/8	21	5 1/4	7	3 3/8	22	10 3/8					8	2 5/8	25	9 1/4	8	8 1/8	27	3
6	10	21	5 1/2	7	3 1/2	22	10 7/8	7	9 1/8	24	4 1/2	8	2 3/4	25	10 1/8	8	8 1/4	27	3 1/8
				7	3 5/8	22	11 1/4	7	9 1/4	24	4 7/8	8	2 7/8	25	10 1/4	8	8 3/8	27	3 1/4
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6	10 1/2	21	7 1/8					7	9 3/4	24	6 1/2	8	3 1/4	25	11 1/2	8	8 7/8	27	5 1/8
6	10 5/8	21	7 1/2	7	4 1/8	23	0 3/4	7	9 7/8	24	6 7/8	8	3 3/8	26	0 1/4	8	9	27	5 1/4
6	10 3/4	21	7 7/8	7	4 1/4	23	1 1/8	7	10	24	7 1/4	8	3 1/2	26	0 1/2				
6	10 7/8	21	8 1/4	7	4 3/8	23	1 1/2					8	3 5/8	26	0 3/4	8	9 1/4	27	6 1/4
6	11	21	8 1/2	7	4 1/2	23	2	7	10 1/8	24	7 5/8	8	3 3/4	26	1	8	9 1/2	27	6 3/4
				7	4 5/8	23	2 3/8	7	10 1/4	24	8	8	3 7/8	26	1 1/4	8	9 3/4	27	7
6	11 1/8	21	9 1/8	7	4 3/4	23	2 3/4	7	10 3/8	24	8 3/8	8	4	26	2 1/8	8	9 7/8	27	7 1/8
6	11 1/4	21	9 1/2	7	4 7/8	23	3 1/8	7	10 1/2	24	8 3/4					8	9 5/8	27	7 1/4
6	11 3/8	21	9 7/8	7	5	23	3 1/2	7	10 5/8	24	9 1/8	8	4 1/8	26	2 1/4	8	9 3/4	27	8
6	11 1/2	21	10 1/4					7	10 3/4	24	9 5/8	8	4 1/4	26	2 3/4	8	9 7/8	27	8 1/8
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6	11 3/4	21	11	7	5 1/4	23	4 1/8	7	11	24	10 3/8	8	4 1/2	26	3 5/8				
6	11 7/8	21	11 1/2	7	5 3/8	23	4 1/2					8	4 5/8	26	4	8	10 1/4	27	9 1/8
7	0	21	11 7/8	7	5 1/2	23	5 1/8	7	11 1/8	24	10 3/4	8	4 3/4	26	4 1/2	8	10 1/2	27	9 1/2
				7	5 5/8	23	5 1/2	7	11 1/4	24	11 1/8	8	4 7/8	26	4 7/8	8	10 5/8	27	10 1/8
7	0 1/8	22	0 1/4	7	5 3/4	23	5 7/8	7	11 3/8	24	11 1/2	8	5	26	5 1/4	8	10 3/4	27	10 1/4
7	0 1/4	22	0 5/8	7	5 7/8	23	6 1/4	7	11 1/2	25	0					8	10 7/8	27	10 3/4
7	0 3/8	22	1	7	6	23	6 5/8	7	11 5/8	25	0 3/8	8	5 1/8	26	5 5/8	8	10 3/4	27	11 1/4

Diam.		Circ.		Diam.		Circ.		Diam.		Circ.		Diam.		Circ.		Diam.		Circ.	
Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	in.	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.
4	3 1/8	13	4 1/2	4	8 1/4	14	10 1/4	5	2 1/4	16	3 1/2	5	7 7/8	17	9 1/2	6	1 3/8	19	2 1/2
4	3 1/4	13	5	4	8 1/4	14	10 3/8	5	2 3/8	16	3 3/8	5	8	17	9 5/8	6	1 1/2	19	2 7/8
4	3 3/8	13	5 3/8	4	9	14	11	5	2 1/2	16	4 1/4					6	1 5/8	19	3 1/4
4	3 1/2	13	5 1/2					5	2 5/8	16	4 3/8	5	8 1/8	17	10	6	1 1/4	19	3 3/8
4	3 5/8	13	6 1/8	4	9 1/8	14	11 3/8	5	2 3/4	16	5 1/8	5	8 1/4	17	10 3/8	6	1 7/8	19	4
4	3 3/4	13	6 1/4	4	9 1/4	14	11 1/2	5	2 7/8	16	5 1/2	5	8 3/8	17	10 1/4	6	2	19	4 1/8
4	3 7/8	13	6 7/8	4	9 3/8	15	0 1/8	5	3	16	5 7/8	5	8 1/2	17	11 1/8				
4	4	13	7 1/4	4	9 1/2	15	0 3/8					5	8 5/8	17	11 1/2	6	2 1/8	19	4 1/4
				4	9 5/8	15	1	5	3 1/8	16	6 1/4	5	8 3/4	17	11 7/8	6	2 1/4	19	5 1/4
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4	4 1/4	13	8 1/4	4	9 7/8	15	1 1/2	5	3 3/8	16	7	5	9	18	0 1/4	6	2 1/2	19	6
4	4 3/8	13	8 1/2	4	10	15	2 1/8	5	3 1/2	16	7 3/8					6	2 5/8	19	6 3/8
4	4 1/2	13	8 7/8					5	3 5/8	16	7 7/8	5	9 1/8	18	1 1/8	6	2 3/4	19	6 1/2
4	4 5/8	13	9 1/4	4	10 1/8	15	2 1/2	5	3 3/4	16	8 1/4	5	9 1/4	18	1 1/2	6	2 7/8	19	7 1/8
4	4 1/2	13	9 5/8	4	10 1/4	15	2 5/8	5	3 7/8	16	8 5/8	5	9 3/8	18	1 7/8	6	3	19	7 1/2
4	4 7/8	13	10	4	10 3/8	15	3 1/8	5	4	16	9	5	9 1/2	18	2 1/4				
4	5	13	10 1/2	4	10 1/2	15	3 1/4					5	9 5/8	18	2 3/8	6	3 1/8	19	8
				4	10 5/8	15	4 1/8	5	4 1/8	16	9 1/8	5	9 3/4	18	3	6	3 1/4	19	8 1/8
4	5 1/8	13	10 7/8	4	10 1/2	15	4 1/2	5	4 1/4	16	9 1/4	5	9 7/8	18	3 1/8	6	3 3/8	19	8 1/4
4	5 1/4	13	11 1/4	4	10 7/8	15	4 7/8	5	4 3/8	16	10 1/8	5	10	18	3 7/8	6	3 1/2	19	9 1/8
4	5 3/8	13	11 5/8	4	11	15	5 1/8	5	4 1/2	16	10 3/8					6	3 5/8	19	9 1/2
4	5 1/2	14	0					5	4 5/8	16	11	5	10 1/8	18	4 1/4	6	3 3/4	19	9 7/8
4	5 5/8	14	0 3/8	4	11 1/8	15	5 5/8	5	4 3/4	16	11 3/8	5	10 1/4	18	4 5/8	6	3 7/8	19	10 1/4
4	5 1/4	14	0 7/8	4	11 1/4	15	6 1/8	5	4 7/8	16	11 1/4	5	10 3/8	18	5	6	4	19	10 1/4
4	5 7/8	14	1 1/4	4	11 3/8	15	6 1/2	5	5	17	0 1/8	5	10 1/2	18	5 3/8				
4	6	14	1 3/8	4	11 1/2	15	6 7/8					5	10 5/8	18	5 1/2	6	4 1/8	19	11 1/8
				4	11 5/8	15	7 1/4	5	5 1/8	17	0 1/4	5	10 3/4	18	6 1/4	6	4 1/4	19	11 1/2
4	6 1/8	14	2	4	11 3/4	15	7 3/8	5	5 1/4	17	1	5	10 7/8	18	6 3/8	6	4 3/8	19	11 7/8
4	6 1/4	14	2 3/8	4	11 7/8	15	8	5	5 3/8	17	1 1/8	5	11	18	7	6	4 1/2	20	0 1/4
4	6 3/8	14	2 1/4	5	0	15	8 1/8	5	5 1/2	17	1 1/4					6	4 5/8	20	0 3/8
4	6 1/2	14	3 1/8					5	5 5/8	17	1 3/8					6	4 3/4	20	1
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4	6 1/4	14	4	5	0 1/4	15	9 1/8	5	5 7/8	17	2 1/4	5	11 1/4	18	7 1/4	6	5	20	1 1/4
4	6 7/8	14	4 3/8	5	0 3/8	15	9 5/8	5	6	17	3 1/4	5	11 1/2	18	8 1/8				
4	7	14	4 1/2	5	0 1/2	15	10					5	11 5/8	18	9	6	5 1/8	20	2 1/4
				5	0 5/8	15	10 3/8	5	6 1/8	17	3 5/8	5	11 3/4	18	9 3/8	6	5 1/4	20	2 3/8
4	7 1/8	14	5 1/8	5	0 1/4	15	10 1/4	5	6 1/4	17	4	5	11 7/8	18	9 1/2	6	5 3/8	20	3
4	7 1/4	14	5 1/2	5	0 7/8	15	11 1/8	5	6 3/8	17	4 1/8	6	0	18	10	6	5 1/2	20	3 1/8
4	7 3/8	14	5 7/8	5	1	15	11 1/2	5	6 1/2	17	4 3/8					6	5 5/8	20	3 1/4
4	7 1/2	14	6 1/4					5	6 5/8	17	5 1/8	6	0 1/4	18	10 1/4	6	5 1/4	20	4 1/4
4	7 5/8	14	6 1/2	5	1 1/8	16	0	5	6 3/4	17	5 5/8	6	0 1/2	18	10 7/8	6	5 7/8	20	4 3/8
4	7 1/4	14	7 1/8	5	1 1/4	16	0 3/8	5	6 7/8	17	6	6	0 3/4	18	11 1/4	6	6	20	5
4	7 7/8	14	7 1/2	5	1 3/8	16	0 1/2	5	7	17	6 3/8	6	0 1/2	18	11 1/2				
4	8	14	7 3/8	5	1 1/2	16	1 1/8					6	0 3/8	19	0 1/4	6	6 1/8	20	5 1/8
				5	1 5/8	16	1 1/2	5	7 1/8	17	6 7/8	6	0 1/4	19	0 1/2	6	6 1/4	20	5 1/4
4	8 1/8	14	8 1/4	5	1 3/4	16	1 7/8	5	7 1/4	17	7 1/8	6	0 7/8	19	0 7/8	6	6 3/8	20	6 1/8
4	8 1/4	14	8 3/8	5	1 7/8	16	2 1/8	5	7 3/8	17	7 3/8	6	1	19	1 1/4	6	6 1/2	20	6 1/4
4	8 3/8	14	9	5	2	16	2 1/4	5	7 1/2	17	8					6	6 5/8	20	7
4	8 1/2	14	9 1/2					5	7 5/8	17	8 1/8	6	1 1/8	19	1 3/8	6	6 1/4	20	7 1/8
4	8 5/8	14	9 7/8	5	2 1/8	16	3 1/8	5	7 1/4	17	8 1/4	6	1 1/4	19	2	6	6 7/8	20	7 1/4

Diam.		Circ.		Diam.		Circ.		Diam.		Circ.		Diam.		Circ.		Diam.		Circ.	
Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.
6	7	20	8 1/8	7	0 1/2	22	1 3/8	7	6 1/8	23	7 1/8	7	11 1/2	25	0 3/8	8	5 1/4	26	6
				7	0 3/8	22	1 1/8	7	6 1/4	23	7 1/2	7	11 5/8	25	1 1/8	8	5 3/8	26	6 3/8
6	7 1/8	20	8 1/2	7	0 1/2	22	2 1/4	7	6 3/8	23	7 7/8	8	0	25	1 1/2	8	5 5/8	26	6 1/2
6	7 1/4	20	8 7/8	7	0 7/8	22	2 5/8	7	6 1/2	23	8 1/4					8	5 5/8	26	7 1/4
6	7 3/8	20	9 1/4	7	1	22	3	7	6 5/8	23	8 5/8	8	0 1/8	25	1 7/8	8	5 3/4	26	7 3/8
6	7 1/2	20	9 1/2					7	6 3/4	23	9	8	0 1/4	25	2 1/8	8	5 7/8	26	8
6	7 5/8	20	10 1/8	7	1 1/8	22	3 3/8	7	6 7/8	23	9 3/8	8	0 3/8	25	2 1/4	8	6	26	8 1/8
6	7 3/4	20	10 1/2	7	1 1/4	22	3 1/2	7	7	23	9 1/8	8	0 1/2	25	2 1/8				
6	7 7/8	20	10 7/8	7	1 3/8	22	4 1/8					8	0 5/8	25	3 1/8	8	6 1/8	26	8 1/4
6	8	20	11 1/4	7	1 1/2	22	4 1/2	7	7 1/8	23	10 1/4	8	0 3/4	25	3 7/8	8	6 1/4	26	9 1/8
				7	1 5/8	22	5	7	7 1/4	23	10 3/8	8	0 7/8	25	4 1/4	8	6 3/8	26	9 1/2
6	8 1/8	20	11 5/8	7	1 3/4	22	5 1/8	7	7 3/8	23	11	8	1	25	4 5/8	8	6 1/2	26	10
6	8 1/4	21	0	7	1 7/8	22	5 3/4	7	7 1/2	23	11 3/8					8	6 5/8	26	10 1/8
6	8 3/8	21	0 1/4	7	2	22	6 1/8	7	7 5/8	23	11 3/4	8	1 1/8	25	5 1/8	8	6 3/4	26	10 1/4
6	8 1/2	21	0 1/2					7	7 3/4	24	0 1/8	8	1 1/4	25	5 1/2	8	6 7/8	26	11 1/8
6	8 5/8	21	1 1/4	7	2 1/8	22	6 1/2	7	7 7/8	24	0 1/2	8	1 3/8	25	5 7/8	8	7	26	11 1/4
6	8 3/4	21	1 1/2	7	2 1/4	22	6 7/8	7	8	24	1	8	1 1/2	25	6 1/4				
6	8 7/8	21	2	7	2 3/8	22	7 1/4					8	1 5/8	25	6 5/8	8	7 1/8	26	11 7/8
6	9	21	2 3/8	7	2 1/2	22	7 5/8	7	8 1/8	24	1 3/8	8	1 3/4	25	7	8	7 1/4	27	0
				7	2 5/8	22	8 1/8	7	8 1/4	24	1 1/2	8	1 7/8	25	7 3/8	8	7 3/8	27	0 1/8
6	9 1/8	21	2 7/8	7	2 3/4	22	8 1/2	7	8 3/8	24	2 1/8	8	2	25	7 7/8	8	7 5/8	27	1 1/8
6	9 1/4	21	3 1/4	7	2 7/8	22	8 7/8	7	8 1/2	24	2 1/2					8	7 5/8	27	1 1/2
6	9 3/8	21	3 5/8	7	3	22	9 1/4	7	8 5/8	24	2 7/8	8	2 1/8	25	8 1/4	8	7 3/4	27	1 7/8
6	9 1/2	21	4					7	8 3/4	24	3 1/8	8	2 1/4	25	8 5/8	8	7 7/8	27	2 1/4
6	9 5/8	21	4 3/8	7	3 1/8	22	9 5/8	7	8 7/8	24	3 3/8	8	2 3/8	25	9	8	8	27	2 5/8
6	9 3/4	21	4 1/2	7	3 1/4	22	10	7	9	24	4 1/8	8	2 1/2	25	9 3/8				
6	9 7/8	21	5 1/8	7	3 3/8	22	10 1/8					8	2 5/8	25	9 1/2	8	8 1/8	27	3
6	10	21	5 1/2	7	3 1/2	22	10 1/2	7	9 1/8	24	4 1/2	8	2 3/4	25	10 1/8	8	8 1/4	27	3 1/8
				7	3 5/8	22	11 1/4	7	9 1/4	24	4 7/8	8	2 7/8	25	10 1/2	8	8 3/8	27	3 1/2
6	10 1/8	21	6	7	3 3/4	22	11 1/8	7	9 3/8	24	5 1/4	8	3	25	11	8	8 1/2	27	4 1/8
6	10 1/4	21	6 3/8	7	3 7/8	23	0	7	9 1/2	24	5 5/8					8	8 5/8	27	4 5/8
6	10 3/8	21	6 3/4	7	4	23	0 3/8	7	9 5/8	24	6 1/8	8	3 1/8	25	11 3/8	8	8 3/4	27	5
6	10 1/2	21	7 1/8					7	9 3/4	24	6 1/2	8	3 1/4	25	11 1/2	8	8 7/8	27	5 1/8
6	10 5/8	21	7 1/2	7	4 1/8	23	0 3/4	7	9 7/8	24	6 7/8	8	3 3/8	26	0 1/8	8	9	27	5 1/4
6	10 3/4	21	7 7/8	7	4 1/4	23	1 1/8	7	10	24	7 1/4	8	3 1/2	26	0 1/2				
6	10 7/8	21	8 1/4	7	4 3/8	23	1 1/2					8	3 5/8	26	0 7/8	8	9 1/8	27	6 1/4
6	11	21	8 1/4	7	4 1/2	23	2	7	10 1/8	24	7 5/8	8	3 3/4	26	1 1/8	8	9 1/4	27	6 3/8
				7	4 5/8	23	2 3/8	7	10 1/4	24	8	8	3 7/8	26	1 1/2	8	9 3/8	27	7
6	11 1/8	21	9 1/8	7	4 3/4	23	2 7/8	7	10 3/8	24	8 3/8	8	4	26	2 1/8	8	9 1/2	27	7 1/8
6	11 1/4	21	9 1/2	7	4 7/8	23	3 1/4	7	10 1/2	24	8 7/8					8	9 5/8	27	7 1/4
6	11 3/8	21	9 7/8	7	5	23	3 1/2	7	10 5/8	24	9 1/4	8	4 1/8	26	2 1/4	8	9 3/4	27	7 3/8
6	11 1/2	21	10 1/4					7	10 1/2	24	9 5/8	8	4 1/2	26	2 7/8	8	9 7/8	27	8 1/8
6	11 5/8	21	10 5/8	7	5 1/8	23	3 7/8	7	10 7/8	24	10	8	4 3/8	26	3 1/4	8	10	27	9
6	11 3/4	21	11	7	5 1/4	23	4 1/8	7	11	24	10 3/8	8	4 1/2	26	3 5/8				
6	11 7/8	21	11 1/8	7	5 3/8	23	4 3/4					8	4 5/8	26	4 1/8	8	10 1/8	27	9 1/8
7	0	21	11 7/8	7	5 1/2	23	5 1/8	7	11 1/8	24	10 3/4	8	4 3/4	26	4 1/2	8	10 1/4	27	9 1/4
				7	5 5/8	23	5 1/2	7	11 1/4	24	11 1/8	8	4 7/8	26	4 7/8	8	10 3/8	27	10 1/8
7	0 1/8	22	0 1/4	7	5 3/4	23	5 7/8	7	11 3/8	24	11 1/2	8	5	26	5 1/4	8	10 1/2	27	10 1/4
7	0 1/4	22	0 3/8	7	5 7/8	23	6 1/4	7	11 1/2	25	0					8	10 5/8	27	10 3/8
7	0 3/8	22	1	7	6	23	6 3/8	7	11 5/8	25	0 1/8	8	5 1/8	26	5 5/8	8	10 3/4	27	11 1/4

Diam.		Circ.		Dia.		Circ.		Diam.		Circ.		Diam.		Circ.		Diam.		Circ.	
Ft.	In.	Ft.	In.	F.	I.	Ft.	In.	Ft.	In.	Ft.	In	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.
8	10 7/8	27	11 1/4	9	4 3/8	29	5	9	10	30	10 1/8	10	3 1/4	32	3 7/8	10	9 1/8	33	9 5/8
8	11	28	0 1/8	9	4 1/2	29	5 3/8					10	3 3/8	32	4	10	9 1/4	33	10
				9	4 5/8	29	5 1/2	9	10 1/8	30	11	10	3 1/2	32	4 1/8	10	9 3/8	33	10 3/8
8	11 1/8	28	0 1/8	9	4 3/4	29	6 1/8	9	10 1/4	30	11 3/8	10	3 5/8	32	5 1/8	10	9 1/2	33	10 1/2
8	11 1/4	28	0 3/8	9	4 7/8	29	6 1/4	9	10 3/8	30	11 1/2	10	4	32	5 1/2	10	9 5/8	33	11 1/8
8	11 3/8	28	1 1/2	9	5	29	7	9	10 1/2	31	0 1/4					10	9 3/4	33	11 1/4
8	11 1/2	28	1 5/8					9	10 5/8	31	0 3/8	10	4 1/8	32	5 7/8	10	9 7/8	34	0
8	11 5/8	28	2	9	5 1/8	29	7 3/8	9	10 3/4	31	1	10	4 1/4	32	6 1/8	10	10	34	0 3/8
8	11 3/4	28	2 1/8	9	5 1/4	29	7 1/2	9	10 7/8	31	1 3/8	10	4 3/8	32	6 3/8				
8	11 7/8	28	2 1/4	9	5 3/8	29	8 1/8	9	11	31	1 1/2	10	4 1/2	32	7	10	10 1/8	34	0 3/4
9	0	28	3 1/4	9	5 1/2	29	8 1/4					10	4 5/8	32	7 1/8	10	10 1/4	34	1 1/8
				9	5 5/8	29	8 3/8	9	11 1/8	31	2 1/4	10	4 1/4	32	7 1/4	10	10 3/8	34	1 1/2
9	0 1/8	28	3 3/8	9	5 3/4	29	9 1/8	9	11 1/4	31	2 3/8	10	4 7/8	32	8 1/4	10	10 1/2	34	1 7/8
9	0 1/4	28	4	9	5 7/8	29	9 1/4	9	11 3/8	31	3	10	5	32	8 3/8	10	10 5/8	34	2 3/8
9	0 3/8	28	4 3/8	9	6	29	10 1/8	9	11 1/2	31	3 1/8					10	10 3/4	34	2 1/4
9	0 1/2	28	4 1/2					9	11 5/8	31	3 1/4	10	5 1/8	32	9	10	10 7/8	34	3 1/8
9	0 5/8	28	5 1/4	9	6 1/8	29	10 1/2	9	11 3/4	31	4 1/8	10	5 1/4	32	9 3/8	10	11	34	3 1/2
9	0 3/4	28	5 5/8	9	6 1/4	29	10 7/8	9	11 7/8	31	4 1/4	10	5 3/8	32	9 7/8				
9	0 7/8	28	6	9	6 3/8	29	11 1/8					10	5 1/2	32	10 1/8	10	11 1/8	34	3 7/8
9	1	28	6 3/8	9	6 1/2	29	11 5/8	10	0	31	4 7/8	10	5 5/8	32	10 3/8	10	11 1/4	34	4 1/4
				9	6 5/8	30	0	10	0 1/8	31	5 3/8	10	5 1/4	32	11	10	11 3/8	34	4 5/8
9	1 1/8	28	6 3/4	9	6 3/4	30	0 1/8	10	0 1/4	31	5 1/2	10	5 7/8	32	11 1/8	10	11 1/2	34	5
9	1 1/4	28	7 1/8	9	6 7/8	30	0 3/8	10	0 3/8	31	5 7/8	10	6	32	11 1/4	10	11 5/8	34	5 1/2
9	1 3/8	28	7 1/2	9	7	30	1 1/4	10	0 1/2	31	6 1/8					10	11 3/4	34	5 7/8
9	1 1/2	28	8					10	0 5/8	31	6 3/8	10	6 1/8	33	0 1/8	10	11 7/8	34	6 1/4
9	1 5/8	28	8 1/8	9	7 1/8	30	1 3/8	10	0 3/4	31	7 1/8	10	6 1/4	33	0 3/8	11	0	34	6 5/8
9	1 3/4	28	8 1/4	9	7 1/4	30	2	10	0 7/8	31	7 3/8	10	6 3/8	33	1				
9	1 7/8	28	9 1/8	9	7 3/8	30	2 1/8	10	1	31	8 1/8	10	6 1/2	33	1 3/8	11	0 1/8	34	7
9	2	28	9 1/2	9	7 1/2	30	2 1/4					10	6 5/8	33	1 1/2	11	0 1/4	34	7 3/8
				9	7 5/8	30	2 3/8	10	1 1/8	31	8 1/4	10	6 1/4	33	2 1/8	11	0 3/8	34	7 1/4
9	2 1/8	28	9 7/8	9	7 3/4	30	2 3/8	10	1 1/4	31	8 7/8	10	6 7/8	33	2 1/4	11	0 1/2	34	8 1/4
9	2 1/4	28	10 1/4	9	7 7/8	30	4	10	1 3/8	31	9 1/4	10	7	33	2 7/8	11	0 5/8	34	8 5/8
9	2 3/8	28	10 1/2	9	8	30	4 3/8	10	1 1/2	31	9 1/2					11	0 3/4	34	9
9	2 1/2	28	11 1/8					10	1 5/8	31	10	10	7 1/8	33	3 1/8	11	0 7/8	34	9 3/8
9	2 5/8	28	11 1/2	9	8 1/8	30	4 1/2	10	1 3/4	31	10 3/8	10	7 1/2	33	3 1/4	11	1	34	9 3/4
9	2 3/4	28	11 7/8	9	8 1/4	30	5 1/8	10	1 7/8	31	10 7/8	10	7 5/8	33	4 1/8				
9	2 7/8	29	0 1/4	9	8 3/8	30	5 1/2	10	2	31	11 1/4	10	7 1/2	33	4 1/2	11	1 1/8	34	10 1/8
9	3	29	0 5/8	9	8 1/2	30	6					10	7 5/8	33	4 7/8	11	1 1/4	34	10 1/2
				9	8 5/8	30	6 3/8	10	2 1/8	31	11 5/8	10	7 3/4	33	5 1/4	11	1 3/8	34	11
9	3 1/8	29	1	9	8 3/4	30	6 1/2	10	2 1/4	32	0	10	7 7/8	33	5 5/8	11	1 1/2	34	11 1/2
9	3 1/4	29	1 1/2	9	8 7/8	30	7 1/8	10	2 3/8	32	0 3/8	10	8	33	6 1/8	11	1 5/8	34	11 7/8
9	3 3/8	29	1 7/8	9	9	30	7 1/2	10	2 1/2	32	0 1/4					11	1 3/4	35	0 1/4
9	3 1/2	29	2 1/4					10	2 5/8	32	1 1/8	10	8 1/8	33	6 1/2	11	1 7/8	35	0 1/2
9	3 5/8	29	2 5/8	9	9 1/8	30	7 7/8	10	2 3/4	32	1 1/2	10	8 1/4	33	6 7/8	11	2	35	0 7/8
9	3 3/4	29	3	9	9 1/4	30	8 1/4	10	2 7/8	32	2	10	8 3/8	33	7 1/4				
9	3 7/8	29	3 3/8	9	9 3/8	30	8 5/8	10	3	32	2 3/8	10	8 1/2	33	7 5/8	11	2 1/8	35	1 1/4
9	4	29	3 1/4	9	9 1/2	30	9 1/8					10	8 5/8	33	8	11	2 1/4	35	1 5/8
				9	9 5/8	30	9 1/2	10	3 1/8	32	2 1/2	10	8 3/4	33	8 3/8	11	2 3/8	35	2
9	4 1/8	29	4 1/4	9	9 3/4	30	9 7/8	10	3 1/4	32	3 1/8	10	8 7/8	33	8 7/8	11	2 1/2	35	2 3/8
9	4 1/4	29	4 3/8	9	9 7/8	30	10 1/4	10	3 3/8	32	3 1/4	10	9	33	9 1/8	11	2 5/8	35	2 7/8

Diam.		Circum.		Diam.		Circum.		Diam.		Circum.		Diam.		Circum	
Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.
11	2 3/4	35	3 1/4	11	5 1/2	36	0 3/4	11	8 1/4	36	10 1/8	11	11 1/2	37	7 1/2
11	2 7/8	35	3 5/8	11	5 7/8	36	1 1/8	11	8 7/8	36	10 1/2	11	11 7/8	37	7 7/8
11	3	35	4	11	6	36	1 1/2	11	9	36	10 7/8	12	0	37	8 1/8
11	3 1/8	35	4 1/8	11	6 1/8	36	1 7/8	11	9 1/8	36	11 1/4	12	0 1/8	37	8 1/4
11	3 1/4	35	4 3/8	11	6 1/4	36	2 1/4	11	9 1/4	36	11 1/2	12	0 1/4	37	8 1/2
11	3 3/8	35	5 1/4	11	6 3/8	36	2 5/8	11	9 3/8	37	0 1/8	12	0 3/8	37	9 1/2
11	3 1/2	35	5 3/8	11	6 1/2	36	3	11	9 1/2	37	0 1/2	12	0 1/2	37	9 1/2
11	3 5/8	35	6	11	6 5/8	36	3 1/4	11	9 5/8	37	0 7/8	12	0 5/8	37	10 1/4
11	3 3/4	35	6 1/8	11	6 3/4	36	3 7/8	11	9 3/4	37	1 1/4	12	0 3/4	37	10 5/8
11	3 7/8	35	6 1/4	11	6 7/8	36	4 1/4	11	9 7/8	37	1 5/8	12	0 7/8	37	11 1/8
11	4	35	7 1/4	11	7	36	4 5/8	11	10	37	2	12	1	37	11 1/2
11	4 1/8	35	7 3/8	11	7 1/8	36	5	11	10 1/8	37	2 1/2	12	1 1/8	37	11 3/4
11	4 1/4	35	8	11	7 1/4	36	5 3/8	11	10 1/4	37	2 7/8	12	1 1/4	38	0 1/4
11	4 3/8	35	8 3/8	11	7 3/8	36	5 7/8	11	10 3/8	37	3 1/4	12	1 3/8	38	0 5/8
11	4 1/2	35	8 1/2	11	7 1/2	36	6 1/4	11	10 1/2	37	3 5/8	12	1 1/2	38	1
11	4 5/8	35	9 1/8	11	7 5/8	36	6 5/8	11	10 5/8	37	4	12	1 5/8	38	1 3/8
11	4 3/4	35	9 1/2	11	7 3/4	36	7	11	10 3/4	37	4 3/8	12	1 3/4	38	1 7/8
11	4 7/8	35	10	11	7 7/8	36	7 3/8	11	10 7/8	37	4 1/4	12	1 7/8	38	2 1/4
11	5	35	10 3/8	11	8	36	7 1/4	11	11	37	5 1/4	12	2	38	2 5/8
11	5 1/8	35	10 3/4	11	8 1/8	36	8 1/8	11	11 1/8	37	5 5/8	12	2 1/8	38	3
11	5 1/4	35	11 1/8	11	8 1/4	36	8 1/2	11	11 1/4	37	6	12	2 1/4	38	3 3/8
11	5 3/8	35	11 1/2	11	8 3/8	36	9	11	11 3/8	37	6 3/8	12	2 3/8	38	3 3/4
11	5 1/2	35	11 7/8	11	8 1/2	36	9 3/8	11	11 1/2	37	6 1/2	12	2 1/2	38	4 1/8
11	5 5/8	36	0 1/4	11	8 5/8	36	9 1/2	11	11 5/8	37	7 1/8	12	2 5/8	38	4 5/8

Observations on Tables relating to the Diameters and Circumferences of Circles.

I do not intend to enter into any labored argument to prove the general utility of these Tables, as their simplicity and clearness are sufficient to stamp their value to the artist and mechanic. It will be clearly perceived, on inspection, that the Table commences with as small a diameter as is generally used in hoops and rings, viz. one inch, and increases by the regular gradation of one-eighth of an inch, to upwards of twelve feet; and in the column marked Circumference, against each Diameter stand the respective circumferences: hence all that is necessary on inspecting these Tables is to enter into them with any proposed diameter or circumference, and an answer to the inquiry is immediately obtained.

Example.—Required the circumference of a circle, the diameter being 8 feet 7 7-8 inches?

In the column of circumferences, opposite the given diameter, stands 27 feet 2 1/4 inches, the circumference required.

But it will be necessary to observe, that in the formation of hoops and rings a contraction of the metal takes place. Now, the just allowance for this contraction is the exact thickness of the metal, which must be added to the diameter.

Ex.—In making a hoop whose diameter inside is 6 feet 9 1-8 inches, the thickness of the iron being 1/2 inch, this 1/2 inch must be added to the given diameter, which will make it 6 feet 9 5-8 inches; this will allow 1 5-8 inch

for the contraction in bending in a hoop of the above diameter, giving the circumference or length of iron required for the hoop, 21 feet 4 3-8 inches.

The foregoing example appertains to the formation of hoops or iron bent on the flat; but in the formation of rings or iron bent on the edge, the same rule must also be followed, only taking care to add the *breadth* instead of the thickness. As for example:

To make a ring whose inside diameter is 8 feet 2¼ inches, the *breadth* of the iron being 2½ inches; by adding the 2½ inches to the given diameter, will increase it to 8 feet 4¾ inches; opposite to this diameter in the column of circumferences stands 26 feet 4½ inches, being the length of iron necessary for the ring.

The foregoing observations relate more particularly to plain hoops and rings; but as respects the hoops that are on the wheels of railway carriages, a difference must be observed, which is as follows: These hoops having a flange projecting on the one edge of the surface, it will be necessary, in addition to the thickness of the metal, to add two-thirds of the thickness of the flange to the diameter, as the flange side would contract considerably more than the plain surface; this is supposing the tires are in a straight form, but, in general, they come from the iron-works in a curved state. In the latter case, it will be only necessary to add the thickness of the bare metal, as the aforesaid portion of the thickness of the flange is allowed for in the curve. It has been found that the curve may be exactly obtained, by using four times the circumference of the hoop as a radius.

If the tire has not been previously curved, it may easily be done in the operation of bending; the smith must pay particular attention to this, or he will have his hoop bent in an angle.

But the practical utility of this Table is not confined to smiths alone; to the millwright it will be found equally useful and expeditious, as on a bare inspection of the Table he may ascertain the diameter of any wheel that may be required to be made, the pitch and number of teeth being given.

Ex.—Suppose a wheel were ordered to be made to contain sixty teeth, the pitch of the teeth to be 3 7-8 inches, the dimensions of the wheel may be ascertained simply as follows:

Multiply the pitch of the tooth by the number of teeth the wheel is to contain, and the product will be the circumference of the wheel: thus

$$\begin{array}{rl} & 3\frac{7}{8} \text{ inches pitch of the tooth,} \\ 10 \times 6 = & 60 \text{ the number of teeth,} \\ \hline \text{Feet} \quad 19 & 4\frac{1}{2} \quad \text{the circumference of the wheel.} \end{array}$$

However, by inspecting the column marked Circumference, I find the nearest number to this is 19 feet 4 3-8 inches, which is the eighth of an inch less than the true circumference; but if this 1-8 were divided into 60 equal parts, it would not make the difference of a single hair's-breadth in the size of each tooth; so that it is sufficiently near for any practical purpose. The diameter answering to this circumference is 6 feet 2 inches; consequently, with one-half of this number as a radius, the circumference of the wheel will be described.

The manner in which the foregoing Table of Circumferences is found is as follows: Taking the diameter at unity, we have by decimal proportion

$$\begin{array}{c} \textit{in.} \quad \textit{in.} \\ \text{As } 1 : 3{\cdot}1416 :: 1 : 3{\cdot}1416, \end{array}$$

and the decimal 1416 multiplied by 8, gives the circumference for 1 inch of diameter 3 1-8 inches.

In these Tables the number 3·1416 is divided by 8, which gives ·3927. This decimal proportion has been used as a constant, and the sum multiplied by 8 gives the excess above the decimal value in eighths of an inch.

CIRCUMFERENCES FOR ANGLED IRON HOOPS.

ANGLE OUTSIDE.

Diam.	Circ.	Diam.	Circ.	Diam.	Circ.	Diam.	Circ.	Diam.	Circ.	Diam.	Circ.
Ft. In.	Ft. In.	Ft. In.	Ft. In.	Ft. In.	Ft. In.	Ft. In.	Ft. In.	Ft. In.	Ft. in.	Ft. In.	Ft. In.
6	1 5½	1 6	4 4⅜	2 6	7 3⅞	3 6	10 3	4 6	13 2¼		
¼	1 6¼	¼	4 5⅜	¼	7 4¼	¼	10 3⅜	¼	13 3		
½	1 7	½	4 6⅜	½	7 5⅛	½	10 4⅛	½	13 3¾		
¾	1 7¾	¾	4 6⅞	¾	7 6⅛	¾	10 5¼	¾	13 4⅜		
7	1 8½	1 7	4 7⅜	2 7	7 6⅞	3 7	10 6	4 7	13 5⅛		
¼	1 9¼	¼	4 8⅜	¼	7 7½	¼	10 6¾	¼	13 5¾		
½	1 9⅞	½	4 9⅛	½	7 8¼	½	10 7½	½	13 6⅜		
¾	1 10⅝	¾	4 9¾	¾	7 9	¾	10 8¼	¾	13 7⅛		
8	1 11⅜	1 8	4 10⅝	2 8	7 9¾	3 8	10 8⅞	4 8	13 8⅝		
¼	2 0⅛	¼	4 11⅜	¼	7 10½	¼	10 9½	¼	13 8¾		
½	2 0⅞	½	5 0	½	7 11¼	½	10 10⅛	½	13 9⅝		
¾	2 1¾	¾	5 0¾	¾	8 0	¾	10 11⅛	¾	13 10½		
9	2 2⅝	1 9	5 1½	2 9	8 0⅝	3 9	10 11⅞	4 9	13 11		
¼	2 3	¼	5 2¼	¼	8 1⅜	¼	11 0⅝	¼	13 11¾		
½	2 3⅞	½	5 3	½	8 2⅛	½	11 1⅜	½	14 0½		
¾	2 4½	¾	5 3¾	¾	8 2⅞	¾	11 2	¾	14 1¼		
10	2 5¼	1 10	5 4⅝	2 10	8 3⅝	3 10	11 2¾	4 10	14 2		
¼	2 6	¼	5 5⅜	¼	8 4⅜	¼	11 3⅜	¼	14 2¾		
½	2 6¾	½	5 5⅞	½	8 5⅛	½	11 4¼	½	14 3⅝		
¾	2 7½	¾	5 6⅝	¾	8 5¾	¾	11 5	¾	14 4½		
11	2 8⅜	1 11	5 7⅜	2 11	8 6½	3 11	11 5¾	4 11	14 4⅞		
¼	2 8⅞	¼	5 8⅛	¼	8 7¼	¼	11 6½	¼	14 5⅝		
½	2 9⅝	½	5 8¾	½	8 8	½	11 7⅛	½	14 6⅜		
¾	2 10⅜	¾	5 9½	¾	8 8¾	¾	11 7⅞	¾	14 7⅛		
1 0	2 11⅛	2 0	5 10¼	3 0	8 9½	4 0	11 8⅝	5 0	14 7⅞		
¼	2 11⅞	¼	5 11	¼	8 10¼	¼	11 9⅜	¼	14 8⅝		
½	3 0⅝	½	5 11¾	½	8 11	½	11 10⅛	½	14 9¼		
¾	3 1⅜	¾	6 0½	¾	8 11⅝	¾	11 10⅞	¾	14 10		
1 1	3 2	2 1	6 1¼	3 1	9 0⅜	4 1	11 11⅝	5 1	14 10¾		
¼	3 2¾	¼	6 2	¼	9 1⅛	¼	12 0¼	¼	14 11½		
½	3 3½	½	6 2¾	½	9 1⅞	½	12 1	½	15 0¼		
¾	3 4¼	¾	6 3⅜	¾	9 2⅝	¾	12 1¾	¾	15 1		
1 2	3 5	2 2	6 4⅛	3 2	9 3⅜	4 2	12 2½	5 2	15 1⅝		
¼	3 5¾	¼	6 4⅞	¼	9 4⅛	¼	12 3¼	¼	15 2⅜		
½	3 6⅝	½	6 5⅝	½	9 4⅞	½	12 4	½	15 3¼		
¾	3 7⅜	¾	6 6⅜	¾	9 5½	¾	12 4¾	¾	15 3⅞		
1 3	3 7¼	2 3	6 7⅛	3 3	9 6¼	4 3	12 5½	5 3	15 4¾		
¼	3 8⅛	¼	6 7⅞	¼	9 7	¼	12 6¼	¼	15 5⅝		
½	3 9⅛	½	6 8¾	½	9 7¾	½	12 6⅞	½	15 6⅜		
¾	3 10⅛	¾	6 9¼	¾	9 8½	¾	12 7⅝	¾	15 6⅞		
1 4	3 10⅞	2 4	6 10	3 4	9 9¼	4 4	12 8⅜	5 4	15 7⅞		
¼	3 11⅝	¼	6 10¾	¼	9 9⅞	¼	12 9¼	¼	15 8¾		
½	4 0½	½	6 11½	½	9 10⅝	½	12 9⅞	½	15 9		
¾	4 1	¾	7 0¼	¾	9 11⅜	¾	12 10⅝	¾	15 9⅞		
1 5	4 1¾	2 5	7 1	3 5	10 0⅛	4 5	12 11⅜	5 5	15 10¾		
¼	4 2⅝	¼	7 1¾	¼	10 0⅞	¼	13 0	¼	15 11¼		
½	4 3½	½	7 2⅝	½	10 1⅝	½	13 0¾	½	16 0		
¾	4 4	¾	7 3⅜	¾	10 2⅜	¾	13 1½	¾	16 0¾		

CIRCUMFERENCES FOR ANGLED IRON HOOPS.

ANGLE INSIDE.

Diam.	Circ.	Diam.	Circ.	Diam.	Circ.	Diam.	Circ.	Diam.	Circ.
Ft. In.	Ft. In.	Ft. In.	Ft. In.	Ft. in.	Ft. In.	Ft. In.	Ft. In.	Ft. In.	Ft. In.
6	1 8 1/4	1 6	5 1 1/8	2 6	8 6 1/4	3 6	11 11 1/4	4 6	15 4 7/8
1/4	1 9 3/8	1/4	5 2 1/2	1/4	8 7 3/8	1/4	12 0 5/8	1/4	15 5 1/4
1/2	1 10 1/4	1/2	5 3 1/4	1/2	8 8 3/8	1/2	12 1 1/2	1/2	15 6 5/8
3/4	1 11 1/8	3/4	5 4 1/8	3/4	8 9 1/4	3/4	12 2 3/8	3/4	15 7 1/2
7	1 11 1/2	1 7	5 5	2 7	8 10 1/8	3 7	12 3 1/4	4 7	15 8 1/4
1/4	2 0 3/8	1/4	5 5 7/8	1/4	8 11	1/4	12 4 1/8	1/4	15 9 1/8
1/2	2 1 1/4	1/2	5 6 3/4	1/2	8 11 7/8	1/2	12 4 7/8	1/2	15 10
3/4	2 2 1/8	3/4	5 7 5/8	3/4	9 0 5/8	3/4	12 5 3/4	3/4	15 10 7/8
8	2 3	1 8	5 8 1/2	2 8	9 1 1/2	3 8	12 6 5/8	4 8	15 11 3/4
1/4	2 4 1/2	1/4	5 9 1/4	1/4	9 2 3/8	1/4	12 7 1/2	1/4	16 0 5/8
1/2	2 5	1/2	5 10 1/8	1/2	9 3 1/4	1/2	12 8 3/8	1/2	16 1 1/2
3/4	2 5 7/8	3/4	5 11	3/4	9 4 1/8	3/4	12 9 1/4	3/4	16 2 1/4
9	2 6 3/4	1 9	5 11 7/8	2 9	9 5	3 9	12 10	4 9	16 3 1/8
1/4	2 7 5/8	1/4	6 0 1/2	1/4	9 5 7/8	1/4	12 10 7/8	1/4	16 4
1/2	2 8 1/2	1/2	6 1 5/8	1/2	9 6 3/4	1/2	12 11 3/4	1/2	16 4 7/8
3/4	2 9 3/8	3/4	6 2 1/2	3/4	9 7 1/2	3/4	13 0 5/8	3/4	16 5 3/4
10	2 10 1/4	1 10	6 3 1/4	2 10	9 8 3/8	3 10	13 1 1/2	4 10	16 6 5/8
1/4	2 11	1/4	6 4 1/8	1/4	9 9 1/4	1/4	13 2 3/8	1/4	16 7 1/2
1/2	2 11 7/8	1/2	6 5	1/2	9 10 1/8	1/2	13 3 1/4	1/2	16 8 1/4
3/4	3 0 3/4	3/4	6 5 7/8	3/4	9 11	3/4	13 4	3/4	16 9 1/8
11	3 1 5/8	1 11	6 6 3/4	2 11	9 11 7/8	3 11	13 4 7/8	4 11	16 10
1/4	3 2 1/2	1/4	6 7 5/8	1/4	10 0 5/8	1/4	13 5 3/4	1/4	16 10 7/8
1/2	3 3 3/8	1/2	6 8 1/2	1/2	10 1 1/2	1/2	13 6 5/8	1/2	16 11 3/4
3/4	3 4 1/4	3/4	6 9 1/4	3/4	10 2 3/8	3/4	13 7 1/2	3/4	17 0 5/8
1 0	3 5	2 0	6 10 1/8	3 0	10 3 1/4	4 0	13 8 3/8	5 0	17 1 1/2
1/4	3 5 7/8	1/4	6 11	1/4	10 4 1/8	1/4	13 9 1/4	1/4	17 2 1/4
1/2	3 6 3/4	1/2	6 11 7/8	1/2	10 5	1/2	13 10	1/2	17 3 1/8
3/4	3 7 5/8	3/4	7 0 1/2	3/4	10 5 7/8	3/4	13 10 7/8	3/4	17 4
1 1	3 8 1/2	2 1	7 1 5/8	3 1	10 6 3/4	4 1	13 11 3/4	5 1	17 4 7/8
1/4	3 9 3/8	1/4	7 2 1/2	1/4	10 7 5/8	1/4	14 0 5/8	1/4	17 5 3/4
1/2	3 10 1/8	1/2	7 3 1/4	1/2	10 8 1/2	1/2	14 1 1/2	1/2	17 6 5/8
3/4	3 11	3/4	7 4 1/8	3/4	10 9 1/4	3/4	14 2 3/8	3/4	17 7 1/2
1 2	3 11 7/8	2 2	7 5	3 2	10 10 1/8	4 2	14 3 1/8	5 2	17 8 1/4
1/4	4 0 3/4	1/4	7 5 7/8	1/4	10 11	1/4	14 4	1/4	17 9 1/8
1/2	4 1 5/8	1/2	7 6 3/4	1/2	10 11 7/8	1/2	14 4 7/8	1/2	17 10
3/4	4 2 1/2	3/4	7 7 5/8	3/4	11 0 5/8	3/4	14 5 3/4	3/4	17 10 7/8
1 3	4 3 3/8	2 3	7 8 1/2	3 3	11 1 1/2	4 3	14 6 5/8	5 3	17 11 3/4
1/4	4 4 1/8	1/4	7 9 1/4	1/4	11 2 3/8	1/4	14 7 1/2	1/4	18 0 5/8
1/2	4 5	1/2	7 10 1/8	1/2	11 3 1/4	1/2	14 8 3/8	1/2	18 1 1/2
3/4	4 5 7/8	3/4	7 11	3/4	11 4 1/8	3/4	14 9 1/8	3/4	18 2 1/4
1 4	4 6 3/4	2 4	7 11 7/8	3 4	11 5	4 4	14 10	5 4	18 3 1/8
1/4	4 7 5/8	1/4	8 0 1/2	1/4	11 5 7/8	1/4	14 10 7/8	1/4	18 4
1/2	4 8 1/2	1/2	8 1 5/8	1/2	11 6 3/4	1/2	14 11 3/4	1/2	18 4 7/8
3/4	4 9 3/8	3/4	8 2 1/2	3/4	11 7 5/8	3/4	15 0 5/8	3/4	18 5 3/4
5	4 10 1/8	2 5	8 3 1/4	3 5	11 8 1/2	4 5	15 1 1/2	5 5	18 6 5/8
1/4	4 11	1/4	8 4 1/8	1/4	11 9 1/4	1/4	15 2 1/4	1/4	18 7 1/2
1/2	4 11 7/8	1/2	8 5	1/2	11 10 1/8	1/2	15 3 1/8	1/2	18 8 1/4
3/4	5 0 3/4	3/4	8 5 7/8	3/4	11 10 7/8	3/4	15 4	3/4	18 9 1/8

Observations on Table containing the Circumferences for Angled Iron Hoops.—Angle Outside.

As this Table will be useful to those smiths who chiefly work angled iron, it will be necessary to remark, that the observation made on Tables relating to the Diameters and Circumferences of Circles, respecting adding the thickness of the iron to the diameter, must be attended to in this, with this difference,—the breadth of the angle must be added to the diameter.

Example.—Suppose a hoop is wanted to be made of 2½ inch angled iron, whose diameter inside must be 12 inches. Here the 2½ inches must be added to the 12 inches, which raises the number to 1 foot 2½ inches. Looking into the Table, I find the circumference, or length of iron requisite for the hoop, is 3 feet 6½ inches.

Observations on Table containing the Circumferences for Angled Iron Hoops.—Angle Inside.

The observations respecting this Table are the reverse to those on the preceding one,—viz. the breadth of the angle must be taken from the diameter,—for this reason, that the diameter is taken from outside to outside of the ring.

Suppose a ring is to be made of angled iron, whose diameter outside is to be 12 inches, the breadth of the angle 2½ inches; then, by taking 2½ inches from 12 inches, we have left 9½ inches. Looking into the Table in the column of diameters, I find in the circumference column, opposite 9½ inches, 2 feet 8½ inches, which is the length of iron necessary for the ring.

It has been already observed, that between angled and plain iron a considerable difference exists with regard to the proportion of the circumference to the diameter: this is owing to the angle or flange on one side of the bar, and when the iron is formed into a hoop: it contracts more or less, as the angle or flange may be inside or outside of the hoop. From repeated experiments on this subject, I have ascertained that the proportions of the diameters to the circumferences are as follows:—For the angle inside as 1 : 3·4248, and for the angle outside the hoop, as 1 : 2·9312 :: Diam : Circ'f.

Problem.—To find the circumference of an ellipse, or an oval hoop or ring.

Rule.—Add the length of the two axes together, and multiply the sum by 1·5708 for the circumference; or as it may be used in the Table of Circumferences, take half the sum of the axes as a diameter, with the breadth of the iron added, and enter the Table of Circumferences where it will be found.

Ex.—Required the circumference of an elliptical hoop, whose axes are 18½ and 13 inches, the thickness of the iron being 2½ inches.

$$18\tfrac{1}{2} + 13 = 31\tfrac{1}{2} \div 2 = 15\tfrac{3}{4} + 2\tfrac{1}{2} = 18\tfrac{1}{4}$$ inches the diameter.

Entering into the Table of Diameter with 18¼ inches, the circumference will be found to be 4 feet 9¼ inches.

In constructing elliptical hoops of angled iron, with the angle outside, reference must be made to the Tables for hoops of angled iron; the operation will be similar to the above example. But in hoops where the angle is inside, the thickness of the iron must be taken from half the sum of the axes.

Note.—It must be observed, that in the examples given in the Observations on Table relating to the Diameters and Circumferences of Circles, and also on hoops formed of angled iron, that those circumferences are nothing more than the ends of the iron meeting together; therefore, every smith must allow for the thickening of the ends of the metal previous to scarving the same in order to weld it.

WEIGHT OF A LINEAL FOOT OF MALLEABLE RECTANGULAR OR FLAT IRON.

From an Eighth of an Inch to Three Inches Thick.

T designates the thickness, B. the breadth.

T.	B.	Weight.		T.	B.	Weight.		T.	B.	Weight.		T.	B.	Weight.	
in.	in.	lbs.	ozs.	in.	in.	lbs.	ozs.	in.	in.	lbs.	ozs.	in.	in.	lbs.	ozs.
$\frac{1}{8}$	$\frac{1}{4}$	0	1.6	$\frac{1}{8}$	$10\frac{3}{4}$	4	7·3	$\frac{1}{4}$	$9\frac{1}{2}$	7	14·1	$\frac{3}{8}$	$8\frac{3}{4}$	10	13·8
	$\frac{3}{8}$	0	2·4		11	4	9·0		$9\frac{3}{4}$	8	1·4		9	11	2.8
	$\frac{1}{2}$	0	3·3		$11\frac{1}{4}$	4	10·7		10	8	4·8		$9\frac{1}{4}$	11	7·8
	$\frac{5}{8}$	0	4·1		$11\frac{1}{2}$	4	12·3		$10\frac{1}{4}$	8	8·1		$9\frac{1}{2}$	11	12·7
	$\frac{3}{4}$	0	5·0		$11\frac{3}{4}$	4	14·0		$10\frac{1}{2}$	8	11·4		$9\frac{3}{4}$	12	1·7
	$\frac{7}{8}$	0	5·8		12	4	15·6		$10\frac{3}{4}$	8	14·7		10	12	6·7
	1	0	6·6						11	9	2·0		$10\frac{1}{4}$	12	11 6
	$1\frac{1}{4}$	0	8·3	$\frac{1}{4}$	$\frac{1}{2}$	0	6·6		$11\frac{1}{4}$	9	5·4		$10\frac{1}{2}$	13	0·6
	$1\frac{1}{2}$	0	9·9		$\frac{5}{8}$	0	8·3		$11\frac{1}{2}$	9	8·7		$10\frac{3}{4}$	13	5·6
	$1\frac{3}{4}$	0	11·6		$\frac{3}{4}$	0	10·0		$11\frac{3}{4}$	9	12·0		11	13	10·5
	2	0	13·2		$\frac{7}{8}$	0	11 6		12	9	15·3		$11\frac{1}{4}$	13	15·5
	$2\frac{1}{4}$	0	14·9		1	0	13·2						$11\frac{1}{2}$	14	4·5
	$2\frac{1}{2}$	1	0·6		$1\frac{1}{4}$	1	0·6	$\frac{3}{8}$	$\frac{3}{4}$	0	14·9		$11\frac{3}{4}$	14	9·4
	$2\frac{3}{4}$	1	2·2		$1\frac{1}{2}$	1	3·9		$\frac{7}{8}$	1	1·3		12	14	14·4
	3	1	3·9		$1\frac{3}{4}$	1	7·2		1	1	3·8				
	$3\frac{1}{4}$	1	5·5		2	1	10.5		$1\frac{1}{4}$	1	8·8	$\frac{1}{2}$	1	1	10·4
	$3\frac{1}{2}$	1	7·2		$2\frac{1}{4}$	1	13·8		$1\frac{1}{2}$	1	13·8		$1\frac{1}{4}$	2	1·1
	$3\frac{3}{4}$	1	8·9		$2\frac{1}{2}$	2	1·2		$1\frac{3}{4}$	2	2·7		$1\frac{1}{2}$	2	7·7
	4	1	10·5		$2\frac{3}{4}$	2	4·5		2	2	7·7		$1\frac{3}{4}$	2	14·3
	$4\frac{1}{4}$	1	12·2		3	2	7·8		$2\frac{1}{4}$	2	12·7		2	3	4·9
	$4\frac{1}{2}$	1	13 8		$3\frac{1}{4}$	2	11 1		$2\frac{1}{2}$	3	1·6		$2\frac{1}{4}$	3	11·6
	$4\frac{3}{4}$	1	15·5		$3\frac{1}{2}$	2	14·4		$2\frac{3}{4}$	3	6·6		$2\frac{1}{2}$	4	2·2
	5	2	1·2		$3\frac{3}{4}$	3	1·8		3	3	11·6		$2\frac{3}{4}$	4	8.8
	$5\frac{1}{4}$	2	2·8		4	3	5·1		$3\frac{1}{4}$	4	0·5		3	4	15·4
	$5\frac{1}{2}$	2	4·5		$4\frac{1}{4}$	3	8·4		$3\frac{1}{2}$	4	5·5		$3\frac{1}{4}$	5	6·1
	$5\frac{3}{4}$	2	6·1		$4\frac{1}{2}$	3	11·7		$3\frac{3}{4}$	4	10·5		$3\frac{1}{2}$	5	12·7
	6	2	7 8		$4\frac{3}{4}$	3	15·0		4	4	15·4		$3\frac{3}{4}$	6	3.3
	$6\frac{1}{4}$	2	9·5		5	4	2·4		$4\frac{1}{4}$	5	4·4		4	6	9·9
	$6\frac{1}{2}$	2	11·1		$5\frac{1}{4}$	4	5·7		$4\frac{1}{2}$	5	9·4		$4\frac{1}{4}$	7	0·6
	$6\frac{3}{4}$	2	12·8		$5\frac{1}{2}$	4	9·0		$4\frac{3}{4}$	5	14·3		$4\frac{1}{2}$	7	7·2
	7	2	14·4		$5\frac{3}{4}$	4	12·3		5	6	3·3		$4\frac{3}{4}$	7	13 8
	$7\frac{1}{4}$	3	0·1		6	4	15·6		$5\frac{1}{4}$	6	8·3		5	8	4·4
	$7\frac{1}{2}$	3	1·8		$6\frac{1}{4}$	5	3·0		$5\frac{1}{2}$	6	13·2		$5\frac{1}{4}$	8	11·1
	$7\frac{3}{4}$	3	3·4		$6\frac{1}{2}$	5	6·3		$5\frac{3}{4}$	7	2·2		$5\frac{1}{2}$	9	1·7
	8	3	5·1		$6\frac{3}{4}$	5	9·6		6	7	7·2		$5\frac{3}{4}$	9	8·3
	$8\frac{1}{4}$	3	6·7		7	5	13·0		$6\frac{1}{4}$	7	12·2		6	9	14·9
	$8\frac{1}{2}$	3	8·4		$7\frac{1}{4}$	6	0·2		$6\frac{1}{2}$	8	1·1		$6\frac{1}{4}$	10	5·6
	$8\frac{3}{4}$	3	10·1		$7\frac{1}{2}$	6	3·6		$6\frac{3}{4}$	8	6·1		$6\frac{1}{2}$	10	12·2
	9	3	11·7		$7\frac{3}{4}$	6	7·0		7	8	11·1		$6\frac{3}{4}$	11	2·8
	$9\frac{1}{4}$	3	13·4		8	6	10·2		$7\frac{1}{4}$	9	0·0		7	11	9·4
	$9\frac{1}{2}$	3	15·0		$8\frac{1}{4}$	6	13·5		$7\frac{1}{2}$	9	5·0		$7\frac{1}{4}$	12	0·0
	$9\frac{3}{4}$	4	0·7		$8\frac{1}{2}$	7	0·8		$7\frac{3}{4}$	9	10·0		$7\frac{1}{2}$	12	6·7
	10	4	2·4		$8\frac{3}{4}$	7	4·2		8	9	14·9		$7\frac{3}{4}$	12	13·3
	$10\frac{1}{4}$	4	4·0		9	7	7·5		$8\frac{1}{4}$	10	3·9		8	13	3·9
	$10\frac{1}{2}$	4	5·7		$9\frac{1}{4}$	7	10·8		$8\frac{1}{2}$	10	8·9		$8\frac{1}{4}$	13	10·5

T. designates the thickness. B. the breadth.

T.	B.	Weight.		T.	B.	Weight.		T.	B.	Weight.		T.	B.	Weight.	
in.	in.	lbs.	ozs.	in.	in.	lbs.	ozs.	in.	in.	lbs.	ozs.	in.	in.	lbs.	ozs.
$\frac{1}{8}$	$8\frac{1}{2}$	14	1·2	$\frac{5}{8}$	$9\frac{1}{2}$	19	10·6	$\frac{7}{8}$	$10\frac{3}{4}$	26	11·2	1	2	6	10·0
	$8\frac{3}{4}$	14	7·8		$9\frac{3}{4}$	20	2.9		11	27	5·1		$2\frac{1}{4}$	7	7·2
	9	14	14·4		10	20	11·2		$11\frac{1}{2}$	27	15·1		$2\frac{1}{2}$	8	4.4
	$9\frac{1}{4}$	15	5·0		$10\frac{1}{4}$	21	3·4		$11\frac{1}{2}$	28	9·0		$2\frac{3}{4}$	9	1·7
	$9\frac{1}{2}$	15	11·7		$10\frac{1}{2}$	21	11·7		$11\frac{3}{4}$	29	3·0		3	9	14·7
	$9\frac{3}{4}$	16	2·3		$10\frac{3}{4}$	22	4·0		12	29	12·9		$3\frac{1}{4}$	10	12·2
	10	16	8·9		11	22	12·3						$3\frac{1}{2}$	11	9·4
	$10\frac{1}{4}$	16	15·5		$11\frac{1}{4}$	23	4·6	$\frac{1}{8}$	$1\frac{1}{4}$	5	1·1		$3\frac{3}{4}$	12	6·7
	$10\frac{1}{2}$	17	6·2		$11\frac{1}{2}$	23	12·8		2	5	12·7		4	13	3·9
	$10\frac{3}{4}$	17	12·8		$11\frac{3}{4}$	24	5·1		$2\frac{1}{4}$	6	8·3		$4\frac{1}{4}$	14	1·2
	11	18	3·4		12	24	13·4		$2\frac{1}{2}$	7	3.9		$4\frac{1}{2}$	14	14·4
	$11\frac{1}{4}$	18	10·0						$2\frac{3}{4}$	7	15·5		$4\frac{3}{4}$	15	11·7
	$11\frac{1}{2}$	19	0·7	$\frac{3}{4}$	$1\frac{1}{2}$	3	11·6		3	8	11.1		5	16	8·9
	$11\frac{3}{4}$	19	7·3		$1\frac{3}{4}$	4	5·5		$3\frac{1}{4}$	9	6·7		$5\frac{1}{4}$	17	6·2
	12	19	13·9		2	4	15·4		$3\frac{1}{2}$	10	2.2		$5\frac{1}{2}$	18	3·4
					$2\frac{1}{4}$	5	9·4		$3\frac{3}{4}$	10	13·8		$5\frac{3}{4}$	19	0·7
$\frac{5}{8}$	$1\frac{1}{4}$	2	9·4		$2\frac{1}{2}$	6	3·3		4	11	9·4		6	19	13·9
	$1\frac{1}{2}$	3	1·6		$2\frac{3}{4}$	6	13·2		$4\frac{1}{4}$	12	5·0		$6\frac{1}{4}$	20	11·2
	$1\frac{3}{4}$	3	9·9		3	7	7·2		$4\frac{1}{2}$	13	0·6		$6\frac{1}{2}$	21	8·4
	2	4	2·2		$3\frac{1}{4}$	8	1·1		$4\frac{3}{4}$	13	12·2		$6\frac{3}{4}$	22	5.7
	$2\frac{1}{4}$	4	10·5		$3\frac{1}{2}$	8	11·1		5	14	7·8		7	23	2·9
	$2\frac{1}{2}$	5	2·8		$3\frac{3}{4}$	9	5·0		$5\frac{1}{4}$	15	3·4		$7\frac{1}{4}$	24	0·2
	$2\frac{3}{4}$	5	11·0		4	9	14·9		$5\frac{1}{2}$	15	15·0		$7\frac{1}{2}$	24	13·4
	3	6	3.3		$4\frac{1}{4}$	10	8·9		$5\frac{3}{4}$	16	10·6		$7\frac{3}{4}$	25	10·6
	$3\frac{1}{4}$	6	11·6		$4\frac{1}{2}$	11	2·8		6	17	6·2		8	26	7·9
	$3\frac{1}{2}$	7	3·9		$4\frac{3}{4}$	11	12·7		$6\frac{1}{4}$	18	1·8		$8\frac{1}{4}$	27	5·1
	$3\frac{3}{4}$	7	12·2		5	12	6 7		$6\frac{1}{2}$	18	13·4		$8\frac{1}{2}$	28	2·4
	4	8	4·4		$5\frac{1}{4}$	13	0·6		$6\frac{3}{4}$	19	8·9		$8\frac{3}{4}$	28	15·6
	$4\frac{1}{4}$	8	12.7		$5\frac{1}{2}$	13	10·6		7	20	4·5		9	29	12·9
	$4\frac{1}{2}$	9	5·0		$5\frac{3}{4}$	14	4·5		$7\frac{1}{4}$	21	0·1		$9\frac{1}{4}$	30	10·1
	$4\frac{3}{4}$	9	13·3		6	14	14·4		$7\frac{1}{2}$	21	11.7		$9\frac{1}{2}$	31	7·4
	5	10	5·6		$6\frac{1}{4}$	15	8·4		$7\frac{3}{4}$	22	7·3		$9\frac{3}{4}$	32	4·6
	$5\frac{1}{4}$	10	13·8		$6\frac{1}{2}$	16	2·3		8	23	2.9		10	33	1·9
	$5\frac{1}{2}$	11	6·1		$6\frac{3}{4}$	16	12·2		$8\frac{1}{4}$	23	14·5		$10\frac{1}{4}$	33	15·1
	$5\frac{3}{4}$	11	14·4		7	17	6·2		$8\frac{1}{2}$	24	10·1		$10\frac{1}{2}$	34	12·4
	6	12	6·7		$7\frac{1}{4}$	18	0·1		$8\frac{3}{4}$	25	5·7		$10\frac{3}{4}$	35	9.6
	$6\frac{1}{4}$	12	15·0		$7\frac{1}{2}$	18	10·0		9	26	1·3		11	36	6·9
	$6\frac{1}{2}$	13	7·2		$7\frac{3}{4}$	19	4·0		$9\frac{1}{4}$	26	12·9		$11\frac{1}{4}$	37	4·1
	$6\frac{3}{4}$	13	15·5		8	19	13·9		$9\frac{1}{2}$	27	8.5		$11\frac{1}{2}$	38	1·4
	7	14	7·8		$8\frac{1}{4}$	20	7·8		$9\frac{3}{4}$	28	4·0		$11\frac{3}{4}$	38	14·6
	$7\frac{1}{4}$	15	0.1		$8\frac{1}{2}$	21	1·8		10	28	15·6		12	39	11·9
	$7\frac{1}{2}$	15	8·4		$8\frac{3}{4}$	21	11·7		$10\frac{1}{4}$	29	11·2				
	$7\frac{3}{4}$	16	0·6		9	22	5.7		$10\frac{1}{2}$	30	6·8	$1\frac{1}{8}$	$2\frac{1}{4}$	8	6·1
	8	16	8·9		$9\frac{1}{4}$	22	15·6		$10\frac{3}{4}$	31	2·4		$2\frac{1}{2}$	9	5·0
	$8\frac{1}{4}$	17	1·2		$9\frac{1}{2}$	23	9·5		11	31	14·0		$2\frac{3}{4}$	10	3·9
	$8\frac{1}{2}$	17	9·5		$9\frac{3}{4}$	24	3.5		$11\frac{1}{4}$	32	9·6		3	11	2·8
	$8\frac{3}{4}$	18	1·8		10	24	13·4		$11\frac{1}{2}$	33	5·2		$3\frac{1}{4}$	12	1·7
	9	18	10.0		$10\frac{1}{4}$	25	7·3		$11\frac{3}{4}$	34	0·8		$3\frac{1}{2}$	13	0·6
	$9\frac{1}{4}$	19	2 3		$10\frac{1}{2}$	26	1·3		12	34	12.4		$3\frac{3}{4}$	13	15·5

T. designates the thickness, B. the breadth.

T.	B.	Weight.		T.	B.	Weight.		T.	B.	Weight.		T.	B.	Weight.	
in.	in	lbs.	ozs.	in.	in.	lbs.	ozs.	in	in.	lbs.	ozs.	in.	in.	lbs.	ozs.
1/8	4	14	14·4	1/4	6 1/2	25	14·0	1 3/8	8 3/4	39	13·5	1 1/2	11 1/2	57	2·1
	4 1/4	15	13·3		6 3/4	26	14·5		9	40	15·7		11 3/4	58	5.9
	4 1/2	16	12·2		6 3/4	27	15·1		9 1/4	42	2·0		12	59	9·8
	4 3/4	17	11·1		7	28	15·6		9 1/2	43	4·2				
	5	18	10·0		7 1/4	30	0·2		9 3/4	44	6·4	1 5/8	3 1/4	17	7·8
	5 1/4	19	8·9		7 1/2	31	0·8		10	45	8·6		3 1/2	18	13·4
	5 1/2	20	7·8		7 3/4	32	1·3		10 1/4	46	10·8		3 3/4	20	2·9
	5 3/4	21	6·8		8	33	1·9		10 1/2	47	13·0		4	21	8·4
	6	22	5·7		8 1/4	34	2·4		10 3/4	48	15·2		4 1/4	22	13·9
	6 1/4	23	4·6		8 1/2	35	3·0		11	50	1·5		4 1/2	24	3·5
	6 1/2	24	3·5		8 3/4	36	3·6		11 1/4	51	3·7		4 3/4	25	9·0
	6 3/4	25	2·4		9	37	4·1		11 1/2	52	5·9		5	26	14·5
	7	26	1·3		9 1/4	38	4·7		11 3/4	53	8·1		5 1/4	28	4·0
	7 1/4	27	0·2		9 1/2	39	5·2		12	54	10·3		5 1/2	29	9·6
	7 1/2	27	15·1		9 3/4	40	5·8						5 3/4	30	15·1
	7 3/4	28	14·0		10	41	6·4	1 1/2	3	14	14.4		6	32	4·6
	8	29	12·9		10 1/4	42	6·9		3 1/4	16	2·3		6 1/4	33	10·2
	8 1/4	30	11·8		10 1/2	43	7·5		3 1/2	17	6·2		6 1/2	34	15·7
	8 1/2	31	10·7		10 3/4	44	8·0		3 3/4	18	10·0		6 3/4	36	5·2
	8 3/4	32	9·6		11	45	8·6		4	19	13·9		7	37	10·7
	9	33	8·5		11 1/4	46	9·2		4 1/4	21	1.8		7 1/4	39	0·3
	9 1/4	34	7·4		11 1/2	47	9·7		4 1/2	22	5·7		7 1/2	40	5·8
	9 1/2	35	6·3		11 3/4	48	10·3		4 3/4	23	9·5		7 3/4	41	11·3
	9 3/4	36	5·2		12	49	10·8		5	24	13.4		8	43	0·9
	10	37	4·1						5 1/4	26	1·3		8 1/4	44	6·4
	10 1/4	38	3·0	1 3/8	2 3/4	12	8·3		5 1/2	27	5·1		8 1/2	45	11·9
	10 1/2	39	1·9		3	13	10·6		5 3/4	28	9·0		8 3/4	47	1·4
	10 3/4	40	0·8		3 1/4	14	12·8		6	29	12·9		9	48	7·0
	11	40	15·7		3 1/2	15	15·0		6 1/4	31	0·8		9 1/4	49	12·5
	11 1/4	41	14·6		3 3/4	17	1·2		6 1/2	32	4·6		9 1/2	51	2·0
	11 1/2	42	13·5		4	18	3·4		6 3/4	33	8·5		9 3/4	52	7·6
	11 3/4	43	12·4		4 1/4	19	5·6		7	34	12·4		10	53	13·1
	12	44	11·4		4 1/2	20	7·8		7 1/4	36	0·2		10 1/4	55	2·6
					4 3/4	21	10·1		7 1/2	37	4·1		10 1/2	56	8·1
1/4	2 1/2	10	5·6		5	22	12·3		7 3/4	38	8·0		10 3/4	57	13·7
	2 3/4	11	6·1		5 1/4	23	14·5		8	39	11·9		11	59	3·2
	3	12	6·7		5 1/2	25	0·7		8 1/4	40	15·7		11 1/4	60	8.7
	3 1/4	13	7·2		5 3/4	26	2·9		8 1/2	42	3·6		11 1/2	61	14·2
	3 1/2	14	7·8		6	27	5·1		8 3/4	43	7·5		11 3/4	63	3·8
	3 3/4	15	8·4		6 1/4	28	7·4		9	44	11·4		12	64	9·3
	4	16	8·9		6 1/2	29	9·6		9 1/4	45	15·2				
	4 1/4	17	9·5		6 3/4	30	11·8		9 1/2	47	3·1	1 3/4	3 1/2	20	4·5
	4 1/2	18	10·0		7	31	14·0		9 3/4	48	7·0		3 3/4	21	11·7
	4 3/4	19	10·6		7 1/4	33	0·2		10	49	10·8		4	23	2·9
	5	20	11·2		7 1/2	34	2·4		10 1/4	50	14·7		4 1/4	24	10·1
	5 1/4	21	11·7		7 3/4	35	4·7		10 1/2	52	2·6		4 1/2	26	1·3
	5 1/2	22	12·3		8	36	6·9		10 3/4	53	6·5		4 3/4	27	8·5
	5 3/4	23	12·8		8 1/4	37	9·1		11	54	10·3		5	28	15·6
	6	24	13·4		8 1/2	38	11·3		11 1/4	55	14 2		5 1/4	30	6·8

T. designates the thickness, B. the breadth.

T.	B.	Weight.		T.	B.	Weight.		T.	B.	Weight.		T.	B.	Weight.	
in.	in.	lbs.	ozs.	in.	in.	lbs.	ozs.	in.	in.	lbs.	ozs.	in.	in.	lbs.	ozs.
1¼	5½	31	14·0	1⅞	9	55	14·2	2⅛	4½	31	10·7	2¼	8¾	65	3·2
	5¾	33	5·2		9¼	57	7·0		4¾	33	6·8		9	67	1·0
	6	34	12·4		9½	58	15·9		5	35	3·0		9¼	68	14·9
	6¼	36	3·6		9¾	60	8·7		5¼	36	15·2		9½	70	12·7
	6½	37	10·7		10	62	1·6		5½	38	11·3		9¾	72	10·5
	6¾	39	1·9		10¼	63	10·4		5¾	40	7·5		10	74	8·3
	7	40	9·1		10½	65	3·2		6	42	3·6		10¼	76	6·1
	7¼	42	0·3		10¾	66	12·1		6¼	43	15·8		10½	78	3·9
	7½	43	7·5		11	68	4·9		6½	45	11·9		10¾	80	1·7
	7¾	44	14.7		11¼	69	13·8		6¾	47	8·1		11	81	15·5
	8	46	5·8		11½	71	6·6		7	49	4·2		11¼	83	13·3
	8¼	47	13·0		11¾	72	15·4		7¼	51	0·4		11½	85	11·1
	8½	49	4·2		12	74	8·3		7½	52	12·5		11¾	87	8·9
	8¾	50	11·4						7¾	54	8·7		12	89	6·7
	9	52	2·6	2	4	26	7·9		8	56	4·8				
	9¼	53	9·8		4¼	28	2·4		8¼	58	1·0	2⅜	4¾	37	5·8
	9½	55	1·0		4½	29	12·9		8½	59	13·1		5	39	5·2
	9¾	56	8·1		4¾	31	7·4		8¾	61	9·3		5¼	41	4·7
	10	57	15·3		5	33	1·9		9	63	5·4		5½	43	4·2
	10¼	59	6·5		5¼	34	12·4		9¼	65	1·6		5¾	45	3·6
	10½	60	13·7		5½	36	6·9		9½	66	13·7		6	47	3·1
	10¾	62	4·9		5¾	38	1·4		9¾	68	9·9		6¼	49	2·6
	11	63	12·1		6	39	11·9		10	70	6·0		6½	51	2·0
	11¼	65	3·2		6¼	41	6·4		10¼	72	2·2		6¾	53	1·5
	11½	66	10·4		6½	43	0·9		10½	73	14·3		7	55	1·0
	11¾	68	1·6		6¾	44	11·4		10¾	75	10·5		7¼	57	0·4
	12	69	8·8		7	46	5·8		11	77	6·6		7½	58	15·9
					7¼	48	0·3		11¼	79	2·8		7¾	60	15·3
1⅞	3¾	23	4·6		7½	49	10·8		11½	80	15·0		8	62	14·8
	4	24	13·4		7¾	51	5·3		11¾	82	11·1		8¼	64	14·3
	4¼	26	6·2		8	52	15·8		12	84	7·3		8½	66	13·7
	4½	27	15.1		8¼	54	10·3						8¾	68	13·2
	4¾	29	7·9		8½	56	4·8	2¼	4½	33	8·5		9	70	12·7
	5	31	0·8		8¾	57	15·3		4¾	35	6·3		9¼	72	12·1
	5¼	32	9·6		9	59	9·0		5	37	4·1		9½	74	11·6
	5½	34	2·4		9¼	61	4·3		5¼	39	1·9		9¾	76	11·1
	5¾	35	11·3		9½	62	14·8		5½	40	15·7		10	78	10·5
	6	37	4·6		9¾	64	9·3		5¾	42	13·5		10¼	80	10·0
	6¼	38	13·0		10	66	3·8		6	44	11·4		10½	82	9·4
	6½	40	5·8		10¼	67	14·3		6¼	46	9·2		10¾	84	8·9
	6¾	41	14·6		10½	69	8·8		6½	48	7·0		11	86	8·4
	7	43	7·5		10¾	71	3·3		6¾	50	4·8		11¼	88	7·8
	7¼	45	0·3		11	72	13·8		7	52	2·6		11½	90	7·3
	7½	46	9·2		11¼	74	8·3		7¼	54	0·4		11¾	92	6·8
	7¾	48	2·0		11½	76	2·8		7½	55	14·2		12	94	6·2
	8	49	10·8		11¾	77	13·3		7¾	57	12·0				
	8¼	51	3·7		12	79	7·8		8	59	9·8	2½	5	41	6·4
	8½	52	12·5						8¼	61	7·6		5¼	43	7·5
	8¾	54	5·4	2⅛	4¼	29	14·5		8½	63	5·4		5½	45	8·6

T designates the thickness, B. the breadth.

T.	B.	Weight.		T.	B.	Weight.		T.	B.	Weight.		T.	B.	Weight.	
in.	in.	lbs.	ozs.	in.	in.	lbs.	ozs.	in.	in.	lbs.	ozs.	in.	in.	lbs.	ozs.
2½	5¾	47	9·7	2⅝	7	60	13·7	2¾	8½	77	6·6	2⅞	10¼	97	9·6
	6	49	10·8		7¼	63	0·5		8¾	79	11·1		10½	99	15·7
	6¼	51	12·0		7½	65	3·2		9	81	15·5		10¾	102	5·7
	6½	53	13·1		7¾	67	6·0		9¼	84	3·9		11	104	11·8
	6¾	55	14·2		8	69	8·8		9½	86	8·4		11¼	107	1·9
	7	57	15·3		8¼	71	11·6		9¾	88	12·8		11½	109	8·0
	7¼	60	0·4		8½	73	14·3		10	91	1·2		11¾	111	14·1
	7½	62	1·6		8¾	76	1·1		10¼	93	5·7		12	114	4·2
	7¾	64	2·7		9	78	3·9		10½	95	10·1				
	8	66	3·8		9¼	80	6·7		10¾	97	14·5	3	6	59	9·8
	8¼	68	4·9		9½	82	9·4		11	100	3·0		6¼	62	1·6
	8½	70	6·0		9¾	84	12·2		11¼	102	7.4		6½	64	9·3
	8¾	72	7·2		10	86	15·0		11½	104	11·8		6¾	67	1·0
	9	74	8·3		10¼	89	1·8		11¾	107	0·3		7	69	8·8
	9¼	76	9·4		10½	91	4·6		12	109	4·7		7¼	72	0·5
	9½	78	10·5		10¾	93	7·3						7½	74	8·3
	9¾	80	11·6		11	95	10·1	2⅞	5¾	54	12·0		7¾	77	0·0
	10	82	12·8		11¼	97	12·9		6	57	2·1		8	79	7·8
	10¼	84	13·9		11½	99	15·7		6¼	59	8·2		8¼	81	15·5
	10½	86	15·0		11¾	102	2·4		6½	61	14·2		8½	84	7·3
	10¾	89	0·1		12	104	5·2		6¾	64	4·3		8¾	86	15·0
	11	91	1·2						7	66	10·4		9	89	6·7
	11¼	93	2·4	2¾	5½	50	1·5		7¼	69	0·5		9¼	91	14·5
	11½	95	3·5		5¾	52	5·9		7½	71	6·6		9½	94	6·2
	11¾	97	4·6		6	54	10·3		7¾	73	12·7		9¾	96	14·0
	12	99	5·7		6¼	56	14·8		8	76	2·8		10	99	5·7
					6½	59	3·2		8¼	78	8·9		10¼	101	13·5
2⅝	5¼	45	10·3		6¾	61	7·6		8½	80	15.0		10½	104	5·2
	5½	47	13·0		7	63	12·1		8¾	83	5·0		10¾	106	13·0
	5¾	49	15·8		7¼	66	0·5		9	85	11·1		11	109	4·7
	6	52	2·6		7½	68	4·9		9¼	88	1·2		11¼	111	12·4
	6¼	54	5·4		7¾	70	9·4		9½	90	7·3		11½	114	4·2
	6½	56	8·1		8	72	13·8		9¾	92	13·4		11¾	116	11·9
	6¾	58	10·9		8¼	75	2·2		10	95	3·5		12	119	3·7

OBSERVATIONS ON TABLE OF FLAT IRON.

The weights here given are in pounds, ounces, and decimal parts, avoirdupois; and it will be seen, on inspecting the Table, that the first numbers in each page are those which apply to nut iron, and that the breadth increases by ¼ of an inch. The last numbers in each page show the weight of a square foot, according to the respective thickness of each bar. Hence the weight of any length of a bar of rectangular iron may be ascertained simply, as follows:

Rule.—Multiply the tabular weight, according to the thickness and breadth, by the number of feet in the bar, the product will be the weight required.

Example.—In a bar of iron whose thickness is 2¼ inches, the breadth 6½ inches, and the length 18 feet, what is the weight thereof?

In the Table for 2¼ inches thick, and opposite 6½ inches, stand 48 lbs. 7 ozs.; being the weight of one lineal foot. Multiply this number by 18 feet, and we have as follows;

48 lbs. 7 ozs. × 18 = 871 lbs. 14 ozs.

WEIGHT

OF

MATERIALS.

WEIGHT OF ONE FOOT OF FLAT BAR IRON,

If a Bar of Iron be thicker than contained in the table add together the weight of two numbers, or treble the weight of one number. Wanted the weight of 1 foot of Bar Iron, 4 inches broad and 2 1-4 inches thick. Opposite 4 and under 1 is 13·364, which doubled is 26·728, add the weight of 1-4th, (3·341,) equal 30·069 lbs.

Breadth in inches.	THICKNESS IN PARTS OF AN INCH.								
	1/4	5/16	3/8	7/16	1/2	5/8	3/4	7/8	1 in.
1	.835	1.044	1.253	1.461	1.670	2.088	2.506	2.923	3.340
1 1/4	.939	1.174	1.409	1·644	1.878	2.348	2.818	3.287	3.756
1 1/2	1.044	1.305	1.566	1.826	2.088	2.609	3.132	3.653	4.176
1 3/4	1.148	1.435	1.722	2.009	2.296	2.870	3.444	4.018	4.592
1 5/8	1.252	1.566	1.879	2.192	2.504	3.131	3.758	4.384	5.008
1 7/8	1.358	1.696	2.035	2.374	2.716	3.392	4.070	4.749	5.432
1 7/8	1.462	1.827	2.192	2.557	2.924	3.653	4.384	5.114	5.848
1 7/8	1.566	1.957	2.348	2.740	3.132	3.914	4.696	5.479	6.264
2	1.671	2.088	2.506	2.922	3.342	4.175	5.010	5.845	6.684
2 1/8	1.775	2.218	2.662	3.105	3.550	4.435	5.324	6.210	7.100
2 1/4	1.880	2.348	2.818	3.288	3.760	4.696	5.636	6.575	7.520
2 3/8	1.984	2.479	2.975	3.470	3.968	4.957	5.950	6.941	7.936
2 1/2	2.088	2.609	3.131	3.653	4.176	5.218	6.262	7.306	8.352
2 5/8	2.193	2.740	3.288	3.836	4.386	5.479	6.576	7.671	8.772
2 3/4	2.297	2.870	3.444	4.018	4.594	5.740	6.888	8.036	9.188
2 7/8	2.402	3.001	3.601	4.201	4.804	6.001	7.202	8.402	9.608
3	2.506	3.131	3.758	4.384	5.012	6.262	7.516	8.767	10.024
3 1/8	2.715	3.392	4.071	4.749	5.430	6.784	8.142	9.498	10.860
3 1/4	2.923	3.653	4.384	5.114	5.846	7.306	8.768	10.228	11.692
3 3/8	3.132	3.914	4.697	5.479	6.264	7.828	9.394	10.959	12.528
4	3.341	4.175	5.010	5.845	6.682	8.350	10.020	11.690	13.364
4 1/8	3.549	4.436	5.323	6.210	7.098	8.871	10.646	12.421	14.196
4 1/4	3.758	4.697	5.636	6.575	7.516	9.393	11.272	13.151	15.032
4 3/8	3.966	4.958	5.949	6.941	7.932	9.915	11.898	13.881	15.864
5	4.175	5.219	6.263	7.306	8.350	10.437	12.526	14.612	16.700
5 1/8	4.384	5.479	6.576	7.671	8.768	10.958	13.152	15.343	17.536
5 1/4	4.593	5.741	6.889	8.037	9.186	11.480	13.778	16.073	18.372
5 3/8	4.801	6.001	7.202	8.402	9.602	12.002	14.404	16.804	19.204
6	5.010	6.262	7.515	8.767	10.020	12.524	15.030	17.535	20.042

WEIGHT OF ONE SQUARE FOOT OF SHEET IRON, &c.

Names	Thickness by the Birmingham (Eng.) Wire Gauge.														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Iron	12.50	12.00	11.00	10.00	8.74	8.12	7.50	6.86	6.24	5.62	5.00	4.38	3.75	3.12	2.82
Cop.	14.50	13.90	12.75	11.60	10.10	9.40	8.70	7.90	7.20	6.50	5.80	5.08	4.34	3.60	3.27
Brass	13.75	13.20	12.10	11.00	9.61	8.93	8.25	7.54	6.86	6.18	5.50	4.81	4.12	3.43	3.10
	Thickness by the Wire Gauge.														
	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Iron	2.50	2.18	1.86	1.70	1.54	1.40	1.25	1.12	1.00	.90	.80	.72	.64	.56	.50
Cop.	2.90	2.52	2.15	1.97	1.78	1.62	1·45	1.30	1.16	1.04	.92	.83	.74	.64	.58
Brass	2.75	2.40	2.04	1.87	1.69	1.54	1.37	1.23	1.10	.99	.88	.79	.70	.61	.55

No. 1 Wire Guage is 5-16ths of an inch ; No. 4 is 1-4th ; No. 11 is 1-8th ; No. 13 is 1-12th ; No. 15 is 1-14th ; No. 16 is 1-16th ; No. 17 is 1-18th ; No. 19 is 1-28 ; No. 22 is 1-32.

RUSSIA SHEET IRON

Measures 56 by 28 Inches, and is rated by the weight per sheet. The numbers run from 8 to 18 Russian lbs. per sheet. 8 Russian pounds equal 7·2 English pounds; 9 = 8·1 lbs.; 10 = 9 lbs.; 11 = 10 lbs.; 12 = 11·2 lbs. &c. — 100 Russian lbs. equal 90 lbs. English.

WEIGHT OF ONE SQUARE FOOT OF PLATE IRON, &c.

Thickness in parts of an inch.	Iron.	Copper.	Brass.	Lead.	Thickness in parts of an inch.	Iron.	Copper.	Brass.	Lead.
1/16	2.5	2.9	2.7	3.7	7/16	17.5	20.3	19.0	25.9
1/8	5.0	5.8	5.5	7.4	1/2	20.0	23.2	31.8	29.6
3/16	7.5	8.7	8.2	11.1	9/16	25.0	28.9	27.1	37.0
1/4	10.0	11.6	10.9	14.8	5/8	30.0	34.7	32.5	44.4
5/16	12.5	14.5	13.6	18.5	11/16	35.0	40.4	37.9	57.8
3/8	15.0	17.4	16.3	22.2	1	40.0	46.2	43.3	59.2

WEIGHT ONE FOOT IN LENGTH OF SQUARE AND ROUND BAR IRON.

Side and diameter in inches.	Square Iron in lbs.	Round Iron in lbs.	Side and diameter in inches.	Square Iron in lbs.	Round Iron in lbs.	Side and diameter in inches.	Square Iron in lbs.	Round Iron in lbs.
1/4	.209	.164	1 5/8	8.820	6.928	3 3/4	46.969	36.895
5/16	.326	.256	1 3/4	10.229	8.043	3 7/8	50.153	39.390
3/8	.470	.369	1 7/8	11.743	9.224	4	53.440	41.984
7/16	.640	.503	2	13.360	10.496	4 1/8	56.833	44.637
1/2	.835	.656	2 1/8	15.083	11.846	4 1/4	60.329	47.385
9/16	1.057	.831	2 1/4	16.909	13.283	4 3/8	63.930	50.211
5/8	1.305	1.025	2 3/8	18.840	14.797	4 1/2	67.637	53.132
11/16	1.579	1.241	2 1/2	20.875	16.396	4 5/8	71.445	56.113
3/4	1.879	1.476	2 5/8	23.115	18.146	4 3/4	75.359	59.187
13/16	2.205	1.732	2 3/4	25.259	19.842	4 7/8	79.378	62.344
7/8	2.558	2.011	2 7/8	27.608	21.684	5	83.510	65.585
15/16	2.936	2.306	3	30.070	23.653	5 1/4	92.459	72.618
1	3.340	2.624	3 1/8	32.618	25.620	5 1/2	101.036	79.370
1 1/8	4.228	3.321	3 1/4	35.279	27.709	5 3/4	110.429	86.731
1 1/4	5.219	4.099	3 3/8	38.045	29.881	6	120.243	94.610
1 3/8	6.315	4.961	3 1/2	40.916	32.170			
1 1/2	7.516	5.913	3 5/8	43.890	34.472			

The weight of Bar Iron being 1;
" " " Cast Iron = .95
" " " Steel, 1.03
" " " Copper, 1.16

WEIGHT OF A TEN FEET LENGTH OF HOOP IRON, AND ITS THICKNESS ON THE WIRE GUAGE.

No. 1 *Wire Guage is* $\frac{5}{16}$*ths of an inch;* 4 *is* $\frac{1}{4}$; 7 *is* $\frac{9}{16}$; 11 *is* $\frac{1}{8}$; 13 *is* $\frac{1}{12}$; 15 *is* $\frac{1}{14}$; 16 *is* $\frac{1}{16}$; 17 *is* $\frac{1}{18}$; 19 *is* $\frac{1}{23}$; 21 *is* $\frac{1}{25}$; 22 *is* $\frac{1}{32}$.

Width Iron.	thick. No. 6.	thick. No. 7.	thick. No. 8.	thick. No. 9.	thick. No. 10	thick. No. 11	thick. No. 12	thick. No. 13	thick. No. 14	thick. No. 15	thick. No. 16	thick. No. 17	thick No 18
Ins.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
¾	5·07	4·68	4·28	3·90	3·51	3·12	2·73	2·34	1·95	1·76	1·56	1·36	1·16
⅞	5·90	5·45	4·97	4·55	4·07	3·62	3·17	2·70	2·27	2·05	1·80	1·57	1·35
1	6·76	6·25	5·71	5·20	4·68	4·16	3·65	3·12	2·60	2·35	2·08	1·81	1·55
1⅛	7·60	7·02	6·42	5·85	5·26	4·68	4·10	3·51	2·92	2·62	2·34	2·04	1·75
1¼	8·45	7·81	7·14	6·50	5·85	5·21	4·56	3·90	3·25	2·93	2·60	2·27	1·93
1⅜	9·30	8·59	7·60	7·15	6·43	5·73	5·01	4·29	3·57	3·23	2·86	2·49	2·13
1½	10·15	9·37	8·57	7·80	7·02	6·25	5·47	4·68	3·90	3·52	3·12	2·72	2·32
1⅝	10·95	10·15	9·25	8·45	7·55	6·75	5·90	5·05	4·20	3·80	3·35	2·90	2·50
1¾	11·80	10·90	9·95	9·10	8·15	7·25	6·35	5·40	4·55	4·10	3·60	3·15	2·70
1⅞	12·65	11·65	10·65	9·75	8·75	7·75	6·80	5·80	4·85	4·35	3·85	3·35	2·90
2	13·53	12·50	11·43	10·40	9·36	8·33	7·30	6·25	5·20	4·70	4·16	3·63	3·10
2⅛	14·37	13·27	12·14	11·05	9·95	8·85	7·75	6·64	5·52	4·97	4·42	3·85	3·30
2¼	15·21	14.05	12·85	11·70	10·53	9·37	8·20	7·03	5·85	5·25	4·68	4·08	3 50
2⅜	16·07	14·84	13·32	12·35	11·11	9·89	8·66	7·42	6·17	5·58	4·94	4·31	3·68
2½	16·90	15·62	14·28	13·	11·71	10·42	9·12	7·81	6·50	5·87	5·20	4·54	3·87
2⅝	17·75	16·40	14·75	13·65	12·28	10·93	9·68	8·19	6·82	6·15	5·45	4·75	4·05
2¾	18·61	17·18	15·21	14·30	12·87	11·46	10·03	8·59	7·15	6·46	5·72	4·99	4·26
2⅞	19·45	17·96	16·18	14·95	13·46	11·98	10·49	8·98	7·47	6·75	5·98	5·22	4·45
3	20·30	18·75	17·15	15·60	14·05	12·50	10·95	9·37	7·80	7·05	6·25	5·45	4·65
3¼	21·90	20·30	18·50	16·90	15·10	13·50	11·80	10·10	8·40	7·60	6·70	5·80	5·
3½	23·60	21·80	19·90	18·20	16·30	14·50	12·70	10·80	9·10	8·20	7·20	6·30	5·40
3¾	25·30	23·30	21·30	19·50	17·50	15·50	13·60	11·60	9·70	8·70	7·70	6·70	5·80
4	27·07	25·	22·86	20·80	18·73	16·67	14·60	12·50	10·40	9·40	8·33	7·26	6·20
4¼	28·75	26·55	24·28	22·10	19·90	17·70	15·50	13·28	11·05	9·95	8·84	7·70	6·60
4½	30·43	28·10	25·71	23·40	21·07	18·75	16·40	14·06	11·70	10·50	9·36	8·17	7·
4¾	32·14	29·68	26·64	24·70	22·23	19·79	17·33	14·84	12·35	11·16	9·88	8·62	7·36
5	33·80	31·25	28·57	26·	23·42	20·84	18·25	15·63	13·	11·75	10·41	9·06	7·75
5¼	35·50	32·81	29·50	27·30	24·56	21·86	19·16	16·38	13·65	12·31	10·91	9·51	8·11
5½	37·22	34·37	30·43	28·60	25·75	22·92	20·07	17·18	14·30	12·92	11·45	9·98	8·22
5¾	38·91	35·93	32·36	29·90	26·92	23·96	20·98	17·96	14·95	13·51	11·97	10·44	8·91
6	40·60	37·50	34·30	31·20	28·10	25·	21·90	18·75	15·60	14·10	12·50	10·90	9·30

Hoop Iron ⅝ broad, No. 21, ·685 lbs.; ¾, No. 20, ·885 lbs.; ⅞, No. 19, 1·24 lbs.

REGULAR SIZES COOPER HOOPS.

Width.	*Guage.*	*Width.*	*Guage.*
5-8 & 3-4..	No. 20	1½ 1 3-8, 1¾, 1 5-8 inch.....	No. 16
7-8..	19	1⅞, 1 7-8, 2, 2 1-8, 2¼, 2 3-8, inch..	15
1.....	18	2⅜, 2 5-8, 2¾, 2 7-8, 3 inches,.....	14
1 1-8..	17	3¼, 3½, 3 3-4 inches, ...	13
1¼....	16	4 inches,.....	12

Barrel Hoops, 1, 1 1-16, 1⅛ in. wide, Nos. 16 to 18 Wire Guage, cut 4 to 6 ft. long.
Puncheon Hoops, 1¼, and 1⅜ in. wide, 8 ft., 8 ft. 6 in. to 9 ft. long; Nos. 15 and 16
Butt Hoops, 1¾, 1⅞, 2, and 2¼ inches broad, 10 to 12 feet long. [Wire Guage.
Vat Hoops, 3 to 4 inches broad, Nos. 8, 9, 10, and 11 W. Guage, 20 to 30 ft. long.
Mast Hoops, 3 to 6 inches broad, 3-16 to ¼ inch thick, 12 to 20 feet long.
Mill-Stone Hoops. 5 to 6 inches broad, Nos. 10 and 11 Wire Guage.
Coach and Nave Hoops. 1½ to 3 inches broad, 1-8 to 3-16 inches thick.
Clog Hoops, ¾ to 1¼ inch wide, Nos. 11 to 14 Wire Guage.
Chain Hoops, ½ to ¾ inch wide, No. 10 Wire Guage.

WEIGHT OF FLAT BAR IRON, (*see table*) for Tire Bars, &c., from ¼ to 1 inch thick, and from 1 to 6 inches wide.

See Mensuration for Rule for determining the length of Iron in an unbent state in forming a hoop or ring.

SHIP AND RAILROAD SPIKES.

NUMBER OF IRON SPIKES PER 100 POUNDS.

Manufactured by PHILIP C. PAGE, *Somerville, Mass., and Sold by* PAGE, BRIGGS & BABBITT, 1 & 2 *South Market Street, Boston.*

Ship Spikes or Hatch Nails 1-4 in. sq're.		Ship Spikes or Hatch Nails 5-16 in. sq.		Ship Spikes or Deck Nails 3-8 in. sq're.		Ship Spikes 7-16 inch square.		Ship Spikes 1-2 inch square.		Ship Spikes 9-16 inch square.		Ship Spikes 5-8 inch square.	
size in inc.	No. 1 0 0 lbs.	size in inc.	No. 1 0 0 lbs.	size in inc.	No. 1 0 0 lbs.	size in inc.	No. 1 0 0 lbs.	size in inc.	No. 1 0 0 lbs.	size in inc.	No. 1 0 0 lbs.	size in inc.	No. 1 0 0 lbs.
3	1900	3	1000	4	540	5	340	6	220	8	140	10	80
3½	1580	3½	960	4½	500	5½	310	6½	200	9	120	15	60
4	1320	4	800	5	460	6	300	7	190	10	110	—	—
4½	1220	4½	600	5½	420	6½	280	7½	180	11	100	—	—
5	1020	5	680	6	400	7	260	8	170	—	—	—	—
—	—	6	520	6½	320	7½	240	8½	160	—	—	—	—
—	—	—	—	—	—	8	220	9	150	—	—	—	—
—	—	—	—	—	—	—	—	10	140	—	—	—	—

Rail Road Spikes 9-16ths square 5½ inches 160 per 100 pounds.
Rail Road Spikes 1-2 inch " 5½ " 200 per 100 pounds.

BURDEN'S PATENT SPIKES AND HORSE SHOES.

Manufactured at the Troy Iron and Nail Factory, Troy, New York.

Boat Spikes.		Ship Spikes.		Hook Head.		Horse Shoes.	
Size in inches.	No. in 100 lbs.	Size in inches.	No. in 100 lbs.	Size in inches.	No. in 100 lbs.	Size in inches.	No. in 100 lbs.
3	1750	4	800	4 × ⅜	555	1	84
3½	1468	4½	650	4½ × 7-16	414	2	75
4	1257	5	437	5 × ½	252	3	65
4½	920	5½	430	5½ × ½	241	4	56
5	720	6	420	5½ × 9-16	187	5	39
5½	630	6½	377	6 × 9-16	172	—	—
6	497	7	275	6 × ⅝	138	—	—
6½	478	7½	250	7 × 9-16	140	—	—
7	362	8	174	8 × ⅝	110	—	—
7½	337	8½	163	— —	—	—	—
8	295	9	155	— —	—	—	—
8½	290	10	115	— —	—	—	—
9	210	—	—	— —	—	—	—
10	198	—	—	— —	—	—	—

DIMENSIONS OF CYLINDRICAL COLUMNS OF CAST IRON TO SUSTAIN A PRESSURE WITH SAFETY.

Diameter in inches.	LENGTH OR HEIGHT IN FEET.										
	4	6	8	10	12	14	16	18	20	22	24
	WEIGHT OR LOAD IN CWTS.										
2	72	60	49	40	32	26	22	18	15	13	11
2½	119	105	91	77	65	55	47	40	34	29	25
3	178	163	145	128	111	97	84	73	64	56	49
3½	247	232	214	191	172	156	135	119	106	94	83
4	326	310	288	266	242	220	198	178	160	144	130
4½	418	400	379	354	327	301	275	251	229	208	189
5	522	501	479	452	427	394	365	337	310	285	269
6	607	592	573	550	525	497	469	440	413	386	360
7	1032	1013	989	959	924	887	848	808	765	725	686
8	1333	1315	1289	1259	1224	1185	1142	1097	1052	1005	959
9	1716	1697	1672	1640	1603	1561	1515	1467	1416	1364	1311
10	2119	2100	2077	2045	2007	1964	1916	1865	1811	1755	1697
11	2570	2550	2520	2490	2450	2410	2358	2305	2248	2189	2127
12	3050	3040	3020	2970	2930	2900	2830	2780	2730	2670	2600

Practical utility of the Table.

Note. — Wanting to support the front of a building with cast iron columns 18 feet in length, 8 inches in diameter, and the metal 1 inch in thickness; what weight may I confidently expect each column capable of supporting without tendency to deflection?

Opposite 8 inches diameter and under 18 feet = 1097
* Also opposite 6 in. diameter and under 18 feet = 440

= 657 cwt.

* This deduction is on account of the core.

MOLDER'S TABLE.

Bar Iron being 1,		*Cast Iron* being 1,		*Yellow Pine* being 1,	
Cast Iron equal	.95	Bar Iron equal	1.07	Cast Iron equal	12.
Steel "	1.02	Steel "	1.08	Brass "	12.7
Copper "	1.16	Brass "	1.16	Copper "	13.3
Brass "	1.09	Copper "	1.21	Lead "	18.1
Lead "	1.48	Lead "	1.56	Zinc "	11.5

1. Suppose I have an article of plate iron, the weight of which is 728 lbs., but want the same of copper, and of similar dimensions, what will be its weight?

$$728 \times 1.16 = 844.48 \text{ lbs.}$$

2. A model of Dry Pine weighing 3 lbs., and in which the iron for its construction forms no material portion of the weight, what may I anticipate its weight to be in cast iron.

$$3 \times 12 = 36 \text{ pounds.}$$

It frequently occurs, in the construction of models, that neither the quality or condition of the wood can be properly estimated; and in such cases, it may be a near enough approximation to reckon 13 lbs. of cast iron to each pound of model.

WEIGHT OF CAST IRON PIPES.

Diameter of bore.	Thickness of the metal in inches.								
	¼	⅜	½	⅝	¾	⅞	1	1⅛	1¼
in.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
1	3·1	5·1	7·4	10·0	12·9	16·1	19·6	23·5	27·6
1¼	3·7	6·0	8 6	11.5	14·7	18·3	22·1	26·2	30·7
1½	4·3	6·9	9·8	13·0	16·6	20·4	24·5	29·0	33·7
1¾	4·9	7·8	11·1	14·6	18·4	22·6	27·0	31·8	36·8
2	5·5	8·8	12·3	16·1	20·3	24·7	29·5	34·5	39·9
2¼	6·1	9·~	13·5	17·6	22·1	26·8	31 9	37·3	43·0
2½	6·7	10·o	14·7	19·2	23 9	28·9	34·4	40·0	46·0
2¾	7·4	11·5	16·0	20·7	25·7	31·1	36·8	42·8	49·1
3	8·0	12·4	17·2	22·2	27·6	33·3	39·3	45·6	52·2
3¼	8·6	13·3	18·4	23·8	29·5	35·4	41·7	48 3	55·2
3½	9·2	14·2	19·6	25·3	31·3	37·6	44·2	51·1	58·3
3¾	9·8	15·2	20·9	26·9	33·1	39·7	46·6	53·8	61·4
4	10·4	16·1	22·1	28·4	35·0	41·9	49·1	56·6	64·4
4¼	11·1	17·1	23·4	30·0	36·9	44·1	51·6	59·4	67·6
4½	11·7	18·0	24·5	31·4	38·7	46·2	54·0	62·1	70·6
4¾	12·3	18·9	25·8	33·0	40·5	48·3	56·5	64·9	73·6
5	12·9	19·8	27·0	34·5	42·3	50·5	58·9	67·6	76·7
5¼	13·5	20·7	28·2	36·1	44·2	52·6	61·4	70·4	79·8
5½	14·1	21·6	29·5	37·6	46·0	54·8	63·8	73·2	82·8
5¾	14·7	22·6	30·7	39·1	47·9	56·9	66·3	76·0	85·9
6	15·3	23·5	31·9	40·7	49·7	59·1	68·7	78·7	88·8

WEIGHT OF COPPER PIPES.

Diameter of bore.	Weight in Lbs.	Diameter of bore.	Weight in Lbs.	Diameter of bore.	Weight in Lbs.	Diameter of bore.	Weight in Lbs.
½ in.	·94	1¼ in.	2 08	1⅝ in.	3 03	2½ in.	3·97
⅝	1·33	1⅜	2·23	2	3·21	2⅝	4·12
¾	1·51	1½	2·42	2⅛	3·39	2¾	4·34
1	1·69	1⅝	2·67	2¼	3·58	2⅞	4·56
1⅛	1·89	1¾	2·87	2⅜	3·78	3	4·78

WEIGHT OF PLATE COPPER.

The great variety of thicknesses into which copper is manufactured, cause the weight to be named whereby to determine the thickness required, the unit being that of a common sheet, so designated, viz., 4 feet by 2 feet, in lbs., thus:—

A 70 lb. plate is $\frac{8}{16}$ths of an inch in thickness; 46½ do. $\frac{1}{8}$ do.; 23 do. $\frac{1}{16}$ do.; 11½ do. $\frac{1}{32}$ do.; 6 do. $\frac{1}{64}$ do.

WEIGHT OF SHEET LEAD.

The thickness of lead is also in common determined or understood by the weight; the unit being that of a square or superficial foot; thus:—

4 lbs. lead is $\frac{1}{16}$th of an inch in thickness; 6 do. $\frac{1}{10}$ do.; 7½ do. $\frac{1}{8}$ do.; 11 do. $\frac{3}{16}$ do.; 15 do. $\frac{1}{4}$ do.

COPPERS.—*Dimensions and Weight from 1 to 208 Gallons.*

Inches lag to brim.	Gallons.	Weight in pounds.	Inches lag to brim.	Gallons.	Weight in pounds.	Inches lag to brim.	Gallons.	Weight in pounds.
9⅜	1	1½	24	15	22½	29½	29	43½
12¼	2	3	24½	16	24	30	30	45
14	3	4½	25	17	25½	32	36	54
15½	4	6	25½	18	27	34	43	64½
16½	5	7½	26	19	28½	35	48	72
17½	6	9	26½	20	30	36	53	79½
18½	7	10½	26¾	21	31½	37	58	87
19½	8	12	27	22	33	38	63	94½
20¼	9	13½	27½	23	34½	39	67	100½
21	10	15	27½	24	36	40	71	106½
21½	11	16½	27¾	25	37½	45	104	156
22	12	18	28	26	39	50	146	219
22½	13	19½	28½	27	40½	55	208	312
23¼	14	21	29	28	42			

COPPER TUBING.— *Weight of the usual Thickness.*

When the inside diameter, is ¼ of an inch, 3 ozs.; ⅜ do., 5 ozs.; ½ do., 6 ozs.; ⅝ do., 8 ozs.; ¾ do., 10 ozs. per foot.

BRASS, COPPER, STEEL AND LEAD.—*Weight of a Foot.*

	BRASS.		COPPER.		STEEL.		LEAD.	
Diam'ter and Side of Sq're.	Weight of Round.	Weight of Square.	Weight of Round.	Weight of Square.	Weight of Round.	Weight of Square.	Weight of Round.	Weight of Square.
Inches.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
¼	.17	.22	.19	.24	.17	.21		
⅜	.39	.50	.42	.54	.38	.48		
½	.70	.90	.75	.96	.67	.85		
⅝	1.10	1.40	1.17	1.50	1.04	1.33		
¾	1.59	2.02	1.69	2.16	1.50	1.91		
⅞	2.16	2.75	2.31	2.94	2.05	2.61		
1	2.83	3.60	3.02	3.84	2.67	3.40	3.87	4.93
1⅛	3.58	4.56	3.82	4.86	3.38	4.34	4.90	6.25
1¼	4.42	5.63	4.71	6.	4.18	5.32	6.06	7.71
1⅜	5.35	6.81	5.71	7.27	5.06	6.44	7.33	9.33
1½	6.36	8.10	6.79	8.65	6.02	7.67	8.72	11.11
1⅝	7.47	9.51	7.94	10.15	7.07	9.	10.24	13.04
1¾	8.66	11.03	9.21	11.77	8.20	10.14	11 87	15.12
1⅞	9.95	12.66	10.61	13.52	9.41	11.98	13.63	17.36
2	11.32	14.41	12.08	15.38	10.71	13.63	15.51	19.75
2⅛	12.78	16.27	13.64	17.36	12.05	15.80	17.51	22.29
2¼	14.32	18.24	15.29	19.47	13.51	17.20	19.63	25.
2⅜	15.96	20.32	17.03	21.69	15 05	19.17	21.80	27.80
2½	17.68	22.53	18.87	24.03	16.68	21.21	24.24	30.86
2⅝	19.50	24.83	20.81	26.50	18.39	23.41	26.72	34.02
2¾	21.40	27.25	22.84	29.08	20.18	25.70	29.33	37.34
2⅞	23.39	29.78	24.92	31.79	22.06	28.10	32.05	40.81
3	25.47	32.43	27.18	34.61	24.23	30.60	34.90	44.44

CAST IRON.

Weight of a Foot in Length of Flat Cast Iron.

Width of Iron.	Thick, 1-4th inch.	Thick, 3-8ths inch	Thick, 1-2 inch.	Thick, 5-8ths inch.	Thick, 3-4ths inch.	Thick, 7-8ths inch.	Thick, 1 inch.
Inches.	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.
2	1·56	2·34	3·12	3·90	4·68	5·46	6·25
2¼	1·75	2·63	3·51	4·39	5·27	6·15	7·03
2½	1·95	2·92	3·90	4·88	5·85	6·83	7·81
2¾	2·14	3·22	4·29	5·37	6·44	7·51	8·59
3	2·34	3·51	4·68	5·85	7·03	8·20	9·37
3¼	2·53	3·80	5·07	6·34	7·61	8·88	10·15
3½	2·73	4·10	5·46	6·83	8·20	9·57	10·93
3¾	2·93	4·39	5·85	7·32	8·78	10·25	11·71
4	3·12	4·68	6·25	7·81	9·37	10·93	12·50
4¼	3·32	4·97	6·64	8·30	9·96	11·62	13·28
4½	3·51	5 27	7·03	8·78	10·54	12·30	14·06
4¾	3·71	5·56	7·42	9·27	11·13	12·98	14·84
5	3·90	5·86	7·81	9·76	11·71	13·67	15·62
5¼	4·10	6·15	8·20	10·25	12·30	14·35	16·40
5½	4·29	6·44	8·59	10·74	12·89	15·03	17·18
5¾	4·49	6·73	8·98	11·23	13·46	15·72	17·96
6	4·68	7·03	9·37	11·71	14·06	16·40	18·75

CAST IRON.

Weight of a Superficial Foot from ¼ to 2 inches thick.

Size.	Weight.	Size.	Weight.	Size.	Weight.	Size.	Weight.	Size	Weight.
Ins.	Pounds.	Ins.	Pounds.	Ins.	Pounds.	Ins.	Pounds.	Ins.	Pounds.
¼	9.37	⅝	23.43	1	37.50	1⅜	51.56	1⅝	65.62
⅜	14.06	¾	28.12	1⅛	42.18	1½	56.25	1⅞	70.31
½	18.75	⅞	32.81	1¼	46.87	1⅝	60.93	2	75

CAST IRON, COPPER, BRASS, AND LEAD BALLS.

Weight of Cast Iron, Copper, Brass, and Lead Balls, from 1 inch to 12 inches in Diameter.

Diam.	Cast Iron.	Copper.	Brass.	Lead.	Diam.	Cast Iron.	Copper.	Brass.	Lead.
Ins.	pounds.	pounds.	pounds.	pounds.	Inches.	pounds.	pounds.	pounds.	pounds.
1	·136	·166	·158	·214	7	46·76	57·1	54·5	73·7
1½	·46	·562	·537	·727	7½	57·52	70·0	67·11	90·0
2	1·09	1·3	1·25	1·7	8	69·81	85·2	81·4	110·1
2½	2·13	2·60	2·50	3·35	8½	83·73	102·3	100·0	132·3
3	3·68	4·5	4·3	5·8	9	99.4	121·3	115·9	156·7
3½	5·84	7·14	6·82	9·23	9½	116·9	143·0	136·4	184·7
4	8·72	10·7	10·2	13·8	10	136·35	166·4	159·0	215·0
4½	12·42	15·25	14·5	19·6	10½	157·84	193·0	184·0	250·0
5	17·04	20·8	19·9	26·9	11	181·48	221·8	211·8	286·7
5½	22·68	27·74	26·47	36·0	11½	207·37	253·5	242·0	327·7
6	29·45	35·9	34·3	46·4	12	235·62	288·1	275·0	372·3
6½	37·44	45·76	43·67	59·13					

CAST IRON. — *Weight of a Foot in Length of Square and Round.*

SQUARE.				ROUND.			
Size.	Weight.	Size.	Weight.	Size.	Weight.	Size.	Weight.
Inches Square	Pounds.	Inches Square.	Pounds.	Inches Diam.	Pounds.	Inches Diam.	Pounds.
1/2	·78	4 7/8	74·26	1/2	·61	4 7/8	58·32
5/8	1·22	5	78·12	5/8	·95	5	61·35
3/4	1·75	5 1/8	82·08	3/4	1·38	5 1/8	64·46
7/8	2·39	5 1/4	86·13	7/8	1·87	5 1/4	67·64
1	3·12	5 3/8	90·28	1	2·45	5 3/8	70·09
1 1/8	3·95	5 1/2	94·53	1 1/8	3·10	5 1/2	74·24
1 1/4	4·88	5 5/8	98·87	1 1/4	3 83	5 5/8	77·65
1 3/8	5·90	5 3/4	103·32	1 3/8	4·64	5 3/4	81·14
1 1/2	7·03	5 7/8	107·86	1 1/2	5·52	5 7/8	84·71
1 5/8	8·25	6	112·50	1 5/8	6·48	6	88·35
1 3/4	9·57	6 1/4	122·08	1 3/4	7·51	6 1/4	95·87
1 7/8	10·98	6 1/2	132·03	1 7/8	8·62	6 1/2	103·69
2	12·50	64	142·38	2	9·81	6 3/4	111 82
2 1/8	14·11	7	153·12	2 1/8	11·08	7	120·26
2 1/4	15·81	7 1/4	164·25	2 1/4	12·42	7 1/4	129·
2 3/8	17·62	7 1/2	175·78	2 3/8	13·84	7 1/2	138·05
2 1/2	19·53	7 3/4	187·68	2 1/2	15·33	7 3/4	147·41
2 5/8	21·53	8	200·	2 5/8	16·91	8	157·08
2 3/4	23·63	8 1/4	212·56	2 3/4	18·56	8 1/2	167·05
2 7/8	25·83	8 1/2	225·78	2 7/8	20·28	8 1/2	177·10
3	28·12	8 3/4	239·25	3	22·08	8 3/4	187·91
3 1/8	30·51	9	253·12	3 1/8	23·96	9	198·79
3 1/4	33·	9 1/4	267·38	3 1/4	25·92	9 1/2	210·
3 3/8	35·59	9 1/2	282·	3 3/8	27·95	9 1/2	221·50
3 1/2	38·28	9 3/4	297·07	3 1/2	30·06	9 3/4	233·31
3 5/8	41·06	10	312·50	3 5/8	32·25	10	245·43
3 3/4	43·94	10 1/4	328·32	3 3/4	34·51	10 1/2	257·86
3 7/8	46·92	10 1/2	344·53	3 7/8	36·85	10 1/2	270·59
4	50·	10 3/4	361·13	4	39·27	10 3/4	283·63
4 1/8	53·14	11	378·12	4 1/8	41·76	11	296·97
4 1/4	56·44	11 1/4	395·50	4 1/4	44·27	11 1/4	310·63
4 3/8	59·81	11 1/2	413·28	4 3/8	46·97	11 1/2	324·59
4 1/2	63·28	11 3/4	431·44	4 1/2	49·70	11 3/4	338·85
4 5/8	66·84	12	450·	4 5/8	52·50	12	353·43
4 3/4	70·50			4 3/4	55·37		

STEEL. — *Weight of a Foot in Length of Flat.*

Size.	Thick, 1-4 inch.	Thick, 3-8ths.	Thick, 1-2 inch.	Thick, 5-8ths.	Size.	Thick, 1-4 inch.	Thick, 3-8ths.	Thick, 1-2 inch.	Thick, 5-8ths.
Inches	pounds.	pounds.	pounds.	pounds.	Inches.	pounds.	pounds.	pounds.	pounds.
1	·852	1·27	1·70	2.13	2 1/2	2·13	3·20	4·26	5·32
1 1/8	·958	1·43	1·91	2·39	2 3/4	2·34	3·51	4·68	5·85
1 1/4	1·06	1·59	2·13	2·66	3	2·55	3·83	5·11	6·39
1 3/8	1·17	1·75	2·34	2·92	3 1/4	2·77	4·15	5·53	6·92
1 1/2	1·27	1·91	2·55	3·19	3 1/2	2·98	4·47	5·98	7·45
1 3/4	1·49	2·23	2·98	3·72	3 3/4	3·19	4·79	6·38	7·98
2	1·70	2·55	3·40	4·26	4	3·40	5·10	6·80	8·52
2 1/4	1·91	2·87	3·83	4·79					

WEIGHTS OF ROLLED IRON

Per lineal foot, in pounds and decimal parts, of sections of Parallel Angle, Taper Angle, Parallel T, Taper T, and Sash Iron and Rails.

Table I. — PARALLEL ANGLE IRON, OF EQUAL SIDES.

Length of sides. A B, in inches.	Uniform thickness throughout.	Weight of one lineal foot.
in.	*in.*	
3	$\frac{3}{8}$	8·0
$2\frac{3}{4}$	$\frac{3}{8}$	7 0
$2\frac{1}{2}$	$\frac{3}{8}$	5·75
$2\frac{1}{4}$	5-16ths	4·5
2	$\frac{1}{4}$ full	3·75
$1\frac{3}{4}$	$\frac{1}{4}$	3·0
$1\frac{1}{2}$	$\frac{1}{4}$	2 5
$1\frac{3}{8}$	No. 6 wire guage	1·75
$1\frac{1}{4}$	8	1·5
$1\frac{1}{8}$	9	1 25
1	10	1·0
$\frac{7}{8}$	10	·875
$\frac{3}{4}$	11	·625
$\frac{5}{8}$	11	·563
$\frac{1}{2}$	12	·5

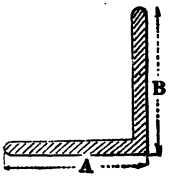


Table II.— PARALLEL ANGLE IRON, OF UNEQUAL SIDES.

L'gth of side A in inches.	L'gth of side B in inches.	Uniform thickness throughout.	Weight of 1 lineal foot.
in.	*in.*	*in.*	
$3\frac{1}{2}$	5	$\frac{3}{8}$	9·75
3	5	$\frac{3}{8}$	8·75
3	4	5-16ths	7·5
$2\frac{1}{2}$	4	5-16ths	6·75
$2\frac{1}{4}$	4	$\frac{1}{4}$	5·75
2	4	$\frac{1}{4}$	5·5
$2\frac{1}{2}$	3	$\frac{1}{4}$	4·75
2	$2\frac{1}{2}$	$\frac{1}{4}$	3·375
$1\frac{1}{2}$	2	$\frac{1}{4}$	2·875
$1\frac{1}{2}$	2	3-16ths	2·25

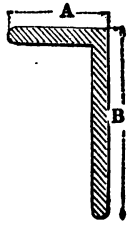
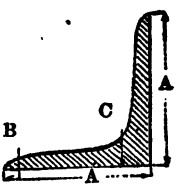


Table III.— TAPER ANGLE IRON, OF EQUAL SIDES

L'gth of sides AA, in inches.	Thickness of edges at B.	Thickness of root at C.	Weight of 1 lineal foot.
in.	*in.*	*in.*	
4	$\frac{1}{2}$	$\frac{5}{8}$	14·0
3	$\frac{1}{2}$	$\frac{5}{8}$	10·375
$2\frac{3}{4}$	7-16ths	9-16ths	8·25
$2\frac{1}{2}$	$\frac{3}{8}$	$\frac{1}{2}$	6·5
$2\frac{1}{4}$	5-16ths, full	7-16ths	5·0
2	$\frac{1}{4}$ full	5-16ths full	3·875
$1\frac{3}{4}$	$\frac{1}{4}$	5-16ths	3·25
$1\frac{1}{2}$	$\frac{1}{4}$ bare	5-16th, bare	2 625



WEIGHTS OF PARALLEL AND TAPER T IRON.

Table IV.—PARALLEL T IRON, OF UNEQUAL WIDTH AND DEPTH.

Width of top table A.	Total depth B.	Uniform thickness top table C	Uniform thickness of rib D.	Weight of one lineal foot.
in.	*in.*	*in.*	*in.*	
5	6	½	½	15·75
4½	3½	½	9-16ths	13·25
4	3	⅜	⅜	8·875
3½	3	⅜	⅜	8·25
3½	4	½	½	12 5
2½	3	⅜	⅜	7·0
2¼	2	5-16ths	⅜ full	4·5
2	1½	5-16ths	5-16ths	4·0
1¾	2	¼	¼	3·125
1½	2	¼	¼	2·875
1¼	1½	¼	¼	2·375
1	1¼	3-16ths	3-16ths	1·5
¾	1	3-16ths	3-16ths	1 125

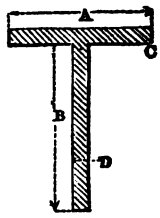


Table V.—PARALLEL T IRON, OF EQUAL DEPTH AND WIDTH.

Width of top table, and total depth A, A.	Uniform thickness throughout	Weight of one lineal foot.
in.	*in.*	
6	½	
5	7-16ths	13·75
4	⅜	9·75
3½	⅜	8·5
3	⅜	7·5
2½	5-16ths	4·625
2¼	5-16ths	4·5
2	5-16ths	3·75
1¾	¼	3·0
1½	¼	2·25
1¼	¼	1·75
1	3-16ths	1·0
⅞	3/16	·725
¾	3/16	·625

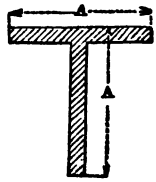
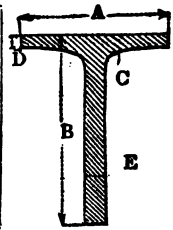


Table VI.—TAPER T IRON

Width of top table A	Total depth B.	Thickness of top table at root C.	Thickness of top table at edges D.	Uniform thickness of rib E.	Weight of one lin. foot.
in.	*in.*	*in.*	*in.*	*in.*	
3	3¼	½	⅜	7-16ths	8·0
3	2⅝	7-16ths	5/16	½	8·0
2	3	7-16ths	5-16ths	5-16ths	5·25
2½	2½	⅝	½	½ full	6·5
2	1½	⅝ full	5-16ths	⅜	3·5
2	1½	5-16ths	¼	¼	2·875



WEIGHT OF SASHES AND RAILS.

Table VII. — SASH IRON.

Total depth A.	Depth of rebate B.	Width at edge C.	greatest width D.	Weight of one lineal foot.
in.	*in.*		*in.*	
2	1	No. 9 w. guage	5-8ths	1·75
$1\frac{3}{4}$	$\frac{3}{4}$	7	9-16ths	1·625
$1\frac{1}{2}$	$\frac{3}{4}$	6	9-16ths	1·25
$1\frac{3}{8}$	$\frac{5}{8}$	10	9-16ths	1·125
$1\frac{1}{4}$	$\frac{5}{8}$	10	9-16ths	1·0
1	$\frac{1}{2}$	$\frac{1}{8}$	$\frac{1}{2}$	·75

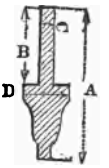
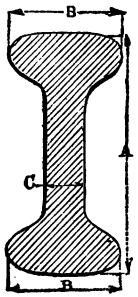


Table VIII. — RAILS EQUAL TOP AND BOTTOM TABLES.

Depth A in inches.	Width across top and bottom, BB, in inches.	Thickness of rib C.	Weight of 1 lin. foot.
in.	*in.*	*in.*	
5	$2\frac{5}{8}$	$\frac{3}{4}$	25·0
$4\frac{1}{2}$	$2\frac{3}{8}$	$\frac{3}{4}$	23·33
$4\frac{1}{2}$	$2\frac{1}{2}$	$\frac{5}{8}$	21·66



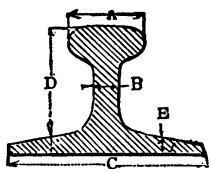


Table IX. — TEMPORARY RAILS.

Top width A.	Rib width B.	Bed width C.	Total depth D.	Thickness of bed E.	Weight of 1 lin. foot
in.	*in.*	*in.*	*in.*	*in.*	
$1\frac{1}{2}$	$\frac{5}{8}$	3	2	7-16ths	9·0
$1\frac{3}{4}$	$\frac{5}{8}$	3	$2\frac{1}{2}$	$\frac{1}{2}$	12·0
$1\frac{7}{8}$	$\frac{5}{8}$	4	3	$\frac{1}{2}$	16·0
2	$\frac{5}{8}$	4	3	$\frac{1}{2}$	17·33

TO ASCERTAIN THE WEIGHTS OF PIPES OF VARIOUS METALS, AND ANY DIAMETER REQUIRED.

Thickness in parts of an inch.	Wrought iron.	Copper.		Lead.	
1-32	·326	11½ lbs. plate	·38	2 lbs. lead	·483
1-16	·653	23½ "	·76	4 "	·967
3-32	·976	35 "	1·14	5½ "	1·45
1-8	1·3	46½ "	1·52	8 "	1·933
5-32	1·627	58 "	1·9	9½ "	2·417
3-16	1·95	70 "	2·28	11 "	2·9
7-32	2·277	80½ "	2·66	13 "	3·383
1-4	2·6	93 "	3·05	15 "	3.867

Rule.—To the interior diameter of the pipe, in inches, add the thickness of the metal; multiply the sum by the decimal numbers opposite the required thickness and under the metal's name; also by the length of the pipe in feet, and the product is the weight of the pipe in lbs.

1. Required the weight of a copper pipe whose interior diameter is 7½ inches, its length 6¼ feet, and the metal 1-8 of an inch in thickness.

$$7{\cdot}5 + {\cdot}125 = 7{\cdot}625 \times 1{\cdot}52 \times 6{\cdot}25 = 72{\cdot}4 \text{ lbs.}$$

2. What is the weight of a leaden pipe 18½ feet in length, 3 inches interior diameter, and the metal ¼ of an inch in thickness?

$$3 + {\cdot}25 = 3{\cdot}25 \times 3{\cdot}867 \times 18{\cdot}5 = 232{\cdot}5 \text{ lbs.}$$

HEXAGONAL NUTS FOR WROUGHT IRON BOLTS.

Diameter of bolts,	⅜	½	⅝	¾	⅞	1	1⅛	1¼	1⅜	1½	1⅝	1¾
Breadth of nuts,	¾	⅞	1⅛	1 5/16	1½	1¾	1 11/16	2 3/16	2⅜	2 9/16	2¾	3

CAPACITY OF CISTERNS AND RESERVOIRS IN GALLONS.

Depth, 10 *Inches: — Diameter from* 2 *to* 25 *Feet.*

2	feet	19·5	5	feet	122·40	8	feet	313·33	12	feet	705·
2½	"	30·6	5½	"	148·10	8½	"	353·72	13	"	827·4
3	"	44·06	6	"	176·25	9	"	396·56	14	"	959·6
3½	"	59·97	6½	"	206·85	9½	"	461·40	15	"	1101·6
4	"	78·33	7	"	239·88	10	"	489·20	20	"	1958·4
4½	"	99·14	7¼	"	275·40	11	"	592·40	25	"	3059.9

NUMBER OF THREADS IN V-THREAD SCREWS.

Diam. in inches,	1/4	5/16	3/8	7/16	1/2	5/8	3/4	7/8	1	1⅛	1¼	1⅜
No. of threads,	20	18	16	14	12	11	10	9	8	7	7	6

Diam. in inches,	1½	1⅝	1¾	1⅞	2	2¼	2½	2¾	3	3¼	3½
No. of threads,	6	5½	5	4½	4½	4	4	3½	3½	3¼	3¼

Diam. in inches,	3¾	4	4¼	4½	4¾	5	5½	5½	5¾	6
No. of threads,	3	3	2⅞	2⅞	2¾	2¾	2⅝	2⅝	2½	2½

The depth of the threads should be half their pitch. The diameter of a screw, to work in the teeth of a wheel, should be such, that the angle of the threads does not exceed 10°.

PROPERTIES OF STEAM,

AND

EVAPORATIVE POWER OF COAL.

ELASTIC FORCE OF STEAM.

Table of the Elastic Force of Steam, and corresponding Temperature of the Water with which it is in Contact.

Pressure in pounds per sq. in.	Elastic force in Inches of Mercury.	Temperature Fahren't.	Volume of Steam compared with Vol. of Water.	Pressure in pounds per sq. in.	Elastic force in Inches of Mercury.	Temperature Fahren't.	Volume of Steam compared with Vol. of Water.
14.7	30.00	212.0	1700	63	128.52	299.2	449
15	30.60	212.8	1669	64	130.56	300.3	443
16	32.64	216.3	1573	65	132 60	301.3	437
17	34.68	219.6	1488	66	134.64	302.4	431
18	36.72	222.7	1411	67	136.68	303.4	425
19	38.76	225.6	1343	68	138.72	304.4	419
20	40.80	228.5	1281	69	140.76	305.4	414
21	42.84	231.2	1225	70	142.80	306.4	408
22	44.88	233.8	1174	71	144.84	307.4	403
23	46.92	236.3	1127	72	146.88	308.4	398
24	48.96	238.7	1084	73	148.92	309.3	393
25	51.00	241.0	1044	74	150.96	310.3	388
26	53.04	243.3	1007	75	153.02	311.2	383
27	55.08	245.5	973	76	155.06	312.2	379
28	57.12	247.6	941	77	157.10	313.1	374
29	59.16	249.6	911	78	159.14	314.0	370
30	61.21	251.6	883	79	161.18	314.9	366
31	63.24	253 6	857	80	163.22	315.8	362
32	65.28	255.5	833	81	165.26	316.7	358
33	67.32	257.3	810	82	167.30	317.6	354
34	69.36	259.1	788	83	169.34	318.4	350
35	71.40	260.9	767	84	171.38	319.3	346
36	73.44	262.6	748	85	173.42	320.1	342
37	75.48	264.3	729	86	175.46	321.0	339
38	77.52	265.9	712	87	177.50	321.8	335
39	79.56	267.5	695	88	179.54	322.6	332
40	81.60	269.1	679	89	181.58	323.5	328
41	83.64	270.6	664	90	183.62	324.3	325
42	85.68	272.1	649	91	185.66	325.1	322
43	87.72	273.6	635	92	187.70	325.9	319
44	89.76	275.0	622	93	189.74	326.7	316
45	91.80	276.4	610	94	191.78	327.5	313
46	93.84	277.8	598	95	193.82	328.2	310
47	95.88	279.2	586	96	195.86	329.0	307
48	97.92	280.5	575	97	197.90	329.8	304
49	99.96	281.9	564	98	199.92	330.5	301
50	102.00	283.2	554	99	201.96	331.3	298
51	104.04	284.4	544	100	204.01	332.0	295
52	106.08	285.7	534	110	224.40	339.2	271
53	108.12	286 9	525	120	244.82	345.8	251
54	110.16	288.1	516	130	265.23	352.1	233
55	112.20	289.3	508	140	285.61	357.9	218
56	114.24	290.5	500	150	306.03	363.4	205
57	116.28	291.7	492	160	326.42	368.7	193
58	118.32	292.9	484	170	346.80	373.6	183
59	120.36	294.2	477	180	367.25	378.4	174
60	122.40	295.6	470	190	387.61	382.9	166
61	124.44	296.9	463	200	408.04	387.3	158
62	126.48	298.1	456				

Water holding impurities in solution tends to retard its attaining the aëriform state, and so impairs the amount of its elastic force at an equal temperature.

Common water.....	boiling point, 212° F.	elastic force,	30	inches
Sea water.....	at 212 "	"	23.05	"
Common water.....	boiling point, 216° F.	"	32.5	"
Sea water.....	at 216 "	"	24.6	"

PRODUCTION AND PROPERTIES OF STEAM.

When water in a vessel is subjected to the action of fire, it readily imbibes the heat or fluid principle of which the fire is the immediate cause, and sooner or later, according to the intensity of the heat, attains a temperature of 212° Fahrenheit. If at this point of temperature the water be not enclosed, but exposed to astmospheric pressure, ebullition will take place, and steam or vapor will ascend through the water, carrying with it the superabundant heat, or that which the water cannot under such circumstances of pressure absorb, to be retained and to indicate a higher temperature.

Water, in attaining the aeriform state, is thus uniformly confined to the same laws under every degree of pressure; but as the pressure is augmented, so is the indicated temperature proportionately elevated: hence the various densities of steam, and corresponding degrees of elastic force.

The preceding Table is peculiarly adapted for estimating the power of steam engines on the condensing principle, because in such the effective force of the steam is the difference between the total force and the resisting vapour retained in the condenser. The following Table is more adapted for estimating the effects of non-condensing engines, as, in such, the atmospheric pressure is not generally taken into account, engines of this principle being supposed to work in a medium; or, the atmospheric pressure on the boiler, to cause a greater density of steam, is equal to the resisting atmosphere which the effluent steam has to contend with on leaving the cylinder.

Table of the Elastic Force of Steam, the Pressure of the Atmosphere not being included.

Elastic Force in			Temperature in degrees of Fahr.	Volume of Steam Water being 1.	Cubic in. of Water in a cubic foot of Steam.
Atmosphere.	lbs. square inch.	inch. of Mer.			
1.19	2.5	5.15	220	1496	1.14
1.22	3	6.18	222	1453	1.18
1.29	4	8.24	225	1366	1.25
1.36	5	10.3	228	1282	1.33
1.70	10	20.6	240	1044	1.64
2.04	15	30.9	251	883	1.93
2.38	20	41.2	260	767	2.23
2.72	25	51.5	268	678	2.52
3.06	30	61.8	275	609	2.81
3.40	35	72.1	282	553	3.09
3.74	40	82.4	288	506	3.38
4.08	45	92.7	294	468	3.66
4.42	50	103.0	299	435	3.93
4.76	55	113.3	304	407	4.20
5.10	60	123.6	309	382	4.48

Steam, independent of the heat indicated by an immersed thermometer, also contains heat that cannot be measured by any instrument at present known, and, in consequence of which, is termed latent or concealed heat; the only positive proof we have of its existence being that of incontestable results or effects produced on various bodies. Thus, if one part by weight of steam at 212° be mixed with nine parts of water at 62°, the result is water at 178·6°; therefore, each of the nine parts of water has received from the steam 116·6° of heat, and consequently the steam has diffused or given out $116.6 \times 9 = 1049.4 - 33.4 = 1016°$ of heat which it must have contained. Again, it is ascertained by experiment, that if one gallon of water be transformed into steam at 212°, and that steam allowed to mix with water at 52°, the whole will be raised to the boiling point, or 212°. From these and other experiments, it is ascertained that the latent heat in steam varies from 940°

to 1044°, the ratio of accumulation advancing from 212°, as the steam becomes more dense and of greater elastic force; hence the severity of a scald by steam to that by boiling water.

The rules formed by experimenters as corresponding with the results of their experiments on the elastic force of steam at given temperatures vary, but approximate so closely that the following rule, because of being simple, may in practice be taken in preference to any other.

Rule.—To the temperature of the steam in degrees of Fahrenheit, add 100, divide the sum by 177, and the 6th power of the quotient equal the force in inches of mercury.

Ex. Required the force of steam corresponding to a temperature of 312°.

$312 + 100 \div 177 = 2.3277^6 = 159$ inches of mercury.

But the Table is much better adapted to practical purposes, as the various results or effects are obtained simply by inspection.

CONSUMPTION OF COAL.

TABLE for finding the CONSUMPTION of COAL per Hour in Steamers either Paddle or Screw (the same Screw being used throughout,) at any Rate of Speed, the Consumption for a particular Rate being known. (At a given Amount of Coal, the Engineer may determine the most prudent Rate of Engine for reaching next coaling Port.)—*Engineer's and Contractor's Pocket Book, London.*

Speed.	Consumption of Coal.	Speed.	Consumption of Coal.	Explanation.
3	.216	9	5.83	
3 1-2	.343	9 1-2	6.86	The speed for the consumption of a unit of coal is supposed here to be 5, which may be 5 miles or knots, or 5 times any number of miles or knots; then if 5 of such number of miles require 1 unit of coal per hour, 9 of such units will, by the table, require 5.83 units of coal, and 3 of them .216 units of coal.
4	.512	10	8.00	
4 1-2	.729	10 1-2	9.26	
5	1.000	11	10.65	
5 1-2	1.331	11 1-2	12.15	
6	1.728	12	13.82	
6 1-2	2.197	12 1-2	15.61	
7	2.744	13	17.58	
7 1-2	3.375	13 1-2	19.68	
8	4.096	14	21.95	
8 1-2	4.910			

It will be evident that this Table is calculated on the principle that the horse power varies very nearly as the cube of the speed; the enormous increase of consumption at increased velocities is in fact a little greater than that shown by the Table.

The advantages indicated above to be obtained at low velocities are evidently independent of those obtained at those velocities by using the steam expansively.

EVAPORATIVE POWER OF COAL AND RESULTS OF COKING.

Under the authority of an Act of the American Congress, approved Sept. 11, 1841, an extensive series of experiments was conducted by Prof. Johnson upon the evaporative power of several kinds of coal. The number of samples tried was 41, including 9 anthracites from Pennsylvania; 12 free-burning or semi-bituminous coals; 11 bituminous from Virginia; 6 foreign bituminous coals, viz. 1 from Sydney, Nova Scotia, sent by the Cunard Coal Mining Company; 1 of Pictou Coal, sent by the same; 1 of Scotch; 1 of Newcastle; 1 of Liverpool; and 1 of Pictou. From one to six trials were

made on each sample, the average quantity used per trial being 978 lbs. The experiments occupied 144 days, during each of which continuous observations were made during 12 or 14 hours.

The coals were burnt under a steam boiler, fitted with apparatus for complete regulation, the supply of water and coals being determined both by weight and measure.

The standard adopted to measure the heating power of each kind of coal was the weight of water which a given weight of each evaporated from the temperature of 212° Fahr.

The following Table gives the results of comparison of six qualities, in each of which that coal which ranks the highest is stated as 1000, and the others in decimal parts of the integer.

Kinds of Coal.	Comparison 1.		Comparison 2.		Comparison 3.		Comparison 4.		Comparison 5.		
	Pounds of steam raised from water at 212° Fahr. by 1 lb. of fuel.	Relative evaporative power for equal weights of coal.	Pounds of steam from 212° produced by 1 cubic foot of each.	Relative evaporative power for equal bulks of coal.	Percentage of total waste in clinker and ashes.	Relative freedom from waste.	Time required to bring the boiler to steady action; in hours.	Relative rapidities of ignition.	Pounds of unburnt coke on the grate after each trial.	Relative completeness of combustion.	Weight in pounds to a cubic foot by experiment.
Anthracites:											
Atkinson and Templeman's	10 70	1.000	566.2	1.000	7.96	.633	0.99	.505	5.1	.725	52.92
Beaver Meadow (No. 5).	9.88	.923	556.1	.982	6.74	.748	2.42	2.07	61.2	.060	56.19
Bituminous and free burning:											
Newcastle .	8.66	.809	439.6	.776	5.68	.887	0.84	.595	10.7	.346	50.82
Pictou . . .	8.48	.792	417.9	.738	12.06	.418	0.85	.588	3.7	1.000	49.25
Liverpool .	7.84	.733	375.4	.663	5.04	1.000	0.86	.581	11 1	.333	47.88
Cannelton, (In)	7.34	.686	348.8	.616	5.12	.984	0.50	1.000	6.4	.578	47.65
Scotch . .	6.95	.649	353.8	.625	10.10	.499	0.96	.521	5.7	.649	51.05
Dry pine wood.	4.69	.436	98.6	.175	0.307	16.417					

The same report states some results of coke-burning, from which it appears that by burning in uncovered heaps, and only covering up the ignited mass when flame ceases to be emitted (as in many of the iron works of Great Britain, France, &c.). the loss in weight at Plymouth has been found to be 17 per cent.; at Penn-y-darran, 20 per cent.; and at Dowlais (where it may be presumed the abundance of coal admits of an uneconomical management), 34 per cent. By coking in stacks, or well covered heaps of coal from 10 to 15 ft. diameter, as followed in Staffordshire, highly bituminous coals lose from 50 to 55 per cent. weight, and those of a drier nature from 35 to 40 per cent.

By coking in close ovens, a coal which, in an uncovered heap. yields only 45 to 50 per cent., yields 69 per cent. In the close oven the *gain* in *bulk* is from 22 to 23 per cent.; and while highly bituminous coals yield only 40 to 45 per cent. in open heaps, and actually *lose* in *bulk*, they yield in close ovens from 65 to 66 per cent., and *gain* in *bulk*. By coking in gas retorts, the Deane Coal of Cumberland gains nearly 30 per cent. in bulk, and loses in weight 25 per cent. Carlisle coal nearly the same. Cannel and Cardiff coals gain 30 per cent. in bulk, and lose 36.5 in weight. Bewick's Wallsend coal loses 30 per cent.; and Russell's Wallsend, 30.7 per cent, by the same process.

AREAS OF CIRCLES.

Diam.	Area.	Diam.	Area.	Diam.	Area.	Diam.	Area.	Diam.	Area.	Diam.	Area.	Diam.	Area.
1 in.	.7854	5 in.	19.635	9 in.	63.617	13 in.	132.732	17 in.	226.980	21 in.	346.361	25 in.	490.875
.9940	20.629		63.986		135.927		220.330		350.497		495.796		
2 in.	1.9271	21.647	9 1/4 in.	64.360	137.886	13 1/4 in.	223.705	21 1/4 in.	354.657	25 1/4 in.	500.741		
1.4848	22.690		67.200		140.500		227.104		358.841		505.711		
1.7671	23.758	6 in.	69.029	9 1/2 in.	143.139	13 1/2 in.	240.598	21 1/2 in.	363.051	25 1/2 in.	510.706		
2.0739	24.850		70.888		145.802		243.977		367.284		515.725		
2.4053	25.967	6 1/4 in.	72.759	9 3/4 in.	148.489	13 3/4 in.	247.450	21 3/4 in.	371.543	25 3/4 in.	520.769		
2.7611	27.108		74.668		151.201		250.947		375.836		525.837		
3 in.	3.1416	6 1/2 in.	76.586	10 in.	78.540	14 in.	153.938	18 in.	254.469	22 in.	380.133	26 in.	530.930
3.5465	28.274		80.515		156.699		258.016		384.465		536.047		
3.9760	29.464	6 3/4 in.	80.516	10 1/4 in.	159.495	14 1/4 in.	261.587	22 1/4 in.	388.822	26 1/4 in.	541.189		
4.4302	30.679		84.540		162.295		265.182		393.203		546.356		
4.9087	31.919	7 in.	86.590	10 1/2 in.	165.130	14 1/2 in.	268.803	22 1/2 in.	397.608	26 1/2 in.	551.547		
5.4119	33.183		88.664		167.969		272.447		402.038		556.763		
5.9395	34.471	7 1/4 in.	90.763	10 3/4 in.	170.873	14 3/4 in.	276.117	22 3/4 in.	406.493	26 3/4 in.	562.002		
6.4918	35.784		92.885		173.782		279.811		410.972		567.267		
4 in.	7.0686	7 1/2 in.	37.122	11 in.	95.033	15 in.	176.715	19 in.	283.529	23 in.	415.476	27 in.	572.556
7.6699	38.484		97.205		179.672		287.272		420.004		577.870		
8.2957	39.871	7 3/4 in.	99.402	11 1/4 in.	182.654	15 1/4 in.	291.039	23 1/4 in.	424.557	27 1/4 in.	583.208		
8.9462	41.282		101.623		185.661		294.831		429.135		588.571		
9.6211	42.718	8 in.	103.869	11 1/2 in.	188.690	15 1/2 in.	298.648	23 1/2 in.	433.731	27 1/2 in.	593.958		
10.320	44.178		106.139		191.748		302.489		438.363		599.370		
11.044	45.663	8 1/4 in.	108.434	11 3/4 in.	194.828	15 3/4 in.	306.355	23 3/4 in.	443.014	27 3/4 in.	604.807		
11.793	47.173		110.753		197.933		310.245		447.699		610.268		
12.566	48.707	8 1/2 in.	113.097	12 in.	201.062	16 in.	314.160	20 in.	452.390	28 in.	615.753		
13.364	50.265		115.466		204.216		318.099		457.115		621.263		
14.186	51.848	8 3/4 in.	117.859	12 1/4 in.	207.394	16 1/4 in.	322.063	20 1/4 in.	461.864	28 1/4 in.	626.798		
15.033	53.456		120.276		210.597		326.051		466.638		632.357		
15.904	55.088	9 in.	122.718	12 1/2 in.	213.825	16 1/2 in.	330.064	20 1/2 in.	471.436	28 1/2 in.	637.941		
16.800	56.745		125.184		217.077		334.101		476.259		643.549		
17.720	58.426	9 1/4 in.	127.676	12 3/4 in.	220.353	16 3/4 in.	338.163	20 3/4 in.	481.106	28 3/4 in.	649.183		
18.665	60.132		130.192		223.654		342.250		485.978		654.839		
5 in.	660.521	9 1/2 in.	61.862	13 in.	671.958	9 1/4	677.714	9 1/4	683.494	9 1/4	695.128	30 in.	706.860
6 in.	666.927	9 3/4 in.											

USE OF THE TABLE: — To find the Capacity of any Cylindrical Measure, from 1 Inch Diameter to 30 Inches, take the inside Diameter of the Measure in Inches, and Multiply the Area in the Table, which corresponds to the Diameter, by the depth in Inches, and divide the Products, if Gills are required, by 7·2175, if Pints by 28.875, if Quarts by 57.75, and if Gallons by 231. If bushels are required, (say in a Tierce or Barrel, after the mean diameter is obtained), multiply as above, and divide the product by 2150.42, the quotient is the number of bushels. Calling the Diameters Feet the Areas are Feet, — then, if a Ship's Water Tank, Steam Boiler, &c., is 5½, or any number of Feet and parts of Feet in Diameter, find the Area in the Table which corresponds in Inches, multiply it by the length in Feet, and multiply this result by a Cubic Foot, (7.4805), and the product is the answer in Gallons. If, in any case, there are more figures in the divisor than in the dividend, add ciphers.

TINMEN'S TABLES,

AND

COMPOSITIONS AND ALLOYS.

TINMEN'S TABLES.

CONTENTS IN GALLONS OF CYLINDRICAL VESSELS.

RULE.—Take the dimensions, in inches and decimal parts of an inch. Square the diameter, multiply it by the length in inches, and then multiply the product by .0034 for Wine Gallons, or by .002785 for Ale Gallons.

EXAMPLE.— How many U. S. Gallons will a Cylindrical Vessel contain, whose diameter is 9 inches, and length 9½ inches?

Diameter,	9	brought up	769.5
	9		.0034
Square Diam.	81		30780
Length,	9.5		23085
	405		2.61630 *
	729		or 2 gallons and 5 pints.
Carried up,	769.5		

CONTENTS IN GALLONS OF SQUARE VESSELS.

RULE.—Take the dimensions in inches and decimal parts of an inch, multiply the length, breadth, and height together, and then multiply the product by .004329 for Wine Gallons, and by .003546 for Ale Gallons.

EXAMPLE.—How many Wine Gallons will a box contain that is 10 feet long, 5 feet wide, and 4 feet deep.

Length in inches,	120	brought up	345600
Breadth in do.	60		.004329
	7200		3110400
Height in inches,	48		691200
	57600		1036800
	28800		1382400
Carried up,	345600		1496.102400 gallons.
			or 1496 galls. and 3½ gills.

TO FIND THE CONTENTS OF A PYRAMID OR CONE.

Solids which decrease gradually from the base till they come to a point, are called *pyramids*. If the pyramid has a square base, it is called a *square pyramid;* if a trianglar base, a *triangular pyramid;* if a circular base, a *circular pyramid*, or a CONE. The point at the top of a pyramid is called the *vertex*, and a line drawn from the *vertex* perpendicular to the base, is the height.

RULE.—Multiply the diameter of the base by itself, and this product by the height, then take ⅓ of this product for the contents; to obtain gallons, divide the last result by 231.

Example.—Required the cubic inches of a Cone whose base is 8 inches diameter, and height 18 inches.

$8 \times 8 = 64 \times 18 = 1152 \div 3 = 384$ cubic inches, $\div 231 = 1$ gall. 2¾ quarts.

* See Table of Decimals equivalent to the fractional parts of a gallon.

TIN PLATES.

Size and Weights, as Imported from England.

Brand Mark.	No. of Sheets in Box.	Length and Breadth.	Weight per Box.	
		Inches. Inches.	Cwt. qr. lbs.	
1 C	225	14 by 10	1 0 0	Each 1x advances $1.75 to $2.00.
1 x	225	14 by 10	1 1 0	
1 xx	225	14 by 10	1 1 21	
1 xxx	225	14 by 10	1 2 14	
1 xxxx	225	14 by 10	1 3 7	
1 xxxxx	225	14 by 10	2 0 0	
1 xxxxxx	225	14 by 10	2 0 21	
D C	100	17 by 12½	0 3 14	In addition, a great variety of sizes are imported for special purposes, usually costing a little more in proportion than those which are esteemed regular sizes.
D x	100	17 by 12½	1 0 14	
D xx	100	17 by 12½	1 1 7	
D xxx	100	17 by 12½	1 2 0	
D xxxx	100	17 by 12½	1 2 21	
D xxxxx	100	17 by 12½	1 3 14	
D xxxxxx	100	17 by 12½	2 0 7	
S D C	200	15 by 11	1 1 27	
S D x	200	15 by 11	1 2 20	
S D xx	200	15 by 11	1 3 13	
S D xxx	200	15 by 11	2 0 6	
S D xxxx	200	15 by 11	2 0 27	
S D xxxxx	200	15 by 11	2 1 20	
S D xxxxxx	200	15 by 11	2 2 13	
T T T Taggers,	225	14 by 10	about 1 0 0	
1 C	225	12 by 12		
1 x	225	12 by 12		
1 xx	225	12 by 12		
1 xxx	225	12 by 12		About the same weight per Box, as the plates above of similar brand, 14 by 10.
1 xxxx	225	12 by 12		
1 C	112	14 by 20		
1 x	112	14 by 20		
1 xx	112	14 by 20		
1 xxx	112	14 by 20		
1 xxxx	112	14 by 20		
Leaded or Ternes 1 C	112	14 by 20	1 0 0	*For Roofing.*
Leaded or Ternes 1 x	112	14 by 20	1 1 0	*For Roofing.*

OIL CANISTERS, *(from 2½ to 125 galls.)* WITH THE QUANTITY AND QUALITY OF TIN REQUIRED FOR CUSTOM WORK.

Galls.	Quantity and Quality.	Galls.	Quantity and Quality.
2½	2 Plates, I X in body.	33	13½ Plates, IX in body, 3 breadths high.
3½	2 " S DX "		
5½	2 " DX "	45	13½ Plates, S D X in body.
8	4 " IX "	60	13½ " D X "
10	3½ " DX "	90	15¼ " D X " *
15	4 " DX "	125	20 " D X "

* The bottom tier of plates to be placed lengthwise.

CAPACITY OF CANS IN GALLONS 1 INCH IN DEPTH, AND FROM 3 TO 40 INCHES DIAMETER.

Diameter.	1 in.	1 1/10	1 2/10	1 3/10	1 4/10	1 5/10	1 6/10	1 7/10	1 8/10	1 9/10
3	.03	.03	.03	.03	.03	.04	.04	.04	.04	.05
4	.05	.05	.05	.06	.06	.06	.07	.07	.07	.08
5	.08	.08	.09	.09	.09	.10	.10	.11	.11	.11
6	.12	.12	.13	.13	.13	.14	.14	.15	.15	.16
7	.16	.17	.17	.18	.18	.19	.19	.20	.20	.21
8	.21	.22	.22	.23	.23	.24	.25	.25	.26	.26
9	.27	.28	.28	.29	.30	.30	.31	.31	.32	.33
10	.34	.34	.35	.36	.36	.37	.38	.38	.39	.40
11	.41	.41	.42	.43	.44	.44	.45	.46	.47	.48
12	.48	.49	.50	.51	.52	.53	.53	.54	.55	.56
13	.57	.58	.59	.60	.60	.61	.62	.63	.64	.65
14	.66	.67	.68	.69	.70	.71	.72	.73	.74	.75
15	.76	.77	.78	.79	.80	.81	.82	.83	.84	.85
16	.87	.88	.89	.90	.91	.92	.93	.94	.95	.97
17	.98	.99	1.00	1.01	1.02	1.04	1.05	1.06	1.07	1.08
18	1.10	1.11	1.12	1.13	1.15	1.16	1.17	1.18	1.20	1.21
19	1.22	1.24	1.25	1.26	1.27	1.29	1.30	1.31	1.33	1.34
20	1.36	1.37	1.38	1.40	1.41	1.42	1.44	1.45	1.47	1.48
21	1.49	1.51	1.52	1.54	1.55	1.57	1.58	1.60	1.61	1.63
22	1.64	1.66	1.67	1.69	1.70	1.72	1.73	1.75	1.77	1.78
23	1.79	1.81	1.83	1.84	1.86	1.87	1.89	1.90	1.92	1.94
24	1.95	1.97	1.99	2.00	2.02	2.04	2.05	2.07	2.09	2.10
25	2.12	2.14	2.15	2.17	2.19	2.21	2.22	2.24	2.26	2.28
26	2.29	2.31	2.33	2.35	2.36	2.38	2.40	2.42	2.44	2.46
27	2.47	2.49	2.51	2.53	2.55	2.57	2·58	2.60	2.62	2.64
28	2.66	2.68	2.70	2.72	2.74	2.76	2.78	2.80	2.82	2.83
29	2.85	2.87	2.89	2.91	2.93	2.95	2.97	2.99	3.01	3.03
30	3.06	3.08	3.10	3.12	3.14	3.16	3.18	3.20	3.22	3.24
31	3.26	3.28	3.30	3.33	3.35	3.37	3.39	3.41	3.43	3.45
32	3.48	3.50	3.52	3.54	3.56	3.59	3.61	3.63	3.65	3.68
33	3.70	3.72	3.74	3.77	3.79	3.81	3.83	3.86	3.88	3.90
34	3.93	3.95	3.97	4.00	4.02	4.04	4.07	4.09	4.11	4.14
35	4.16	4.18	4.21	4.23	4.26	4.28	4.30	4.33	4.35	4.38
36	4.40	4.43	4.45	4.48	4.50	4.52	4.55	4.57	4.60	4.62
37	4.65	4.67	4.70	4.73	4.75	4.78	4.80	4.83	4.85	4.88
38	4.90	4.93	4.96	4.98	5.01	5.03	5.06	5.09	5.12	5.14
39	5.17	5.19	5.22	5.25	5.27	5.30	5.33	5.35	5.38	5.41
40	5.44	5.46	5.49	5.52	5.54	5.57	5.60	5.63	5.65	5.68

TO FIND THE AREA & CIRCUMFERENCE OF AN OVAL.

RULE.—Multiply the longer diameter by the shorter diameter, and by ·7854, and the product will be the area.

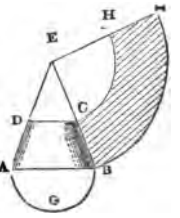
EX.—Required the area of an oval whose longer diameter is 6 inches and shorter diameter 4 inches? $6 \times 4 \times \cdot7854 = 18\cdot8496$, the area.

If half the sum of the two diameters of an Oval be multiplied by 3·1416 the product will be the circumference of the oval.

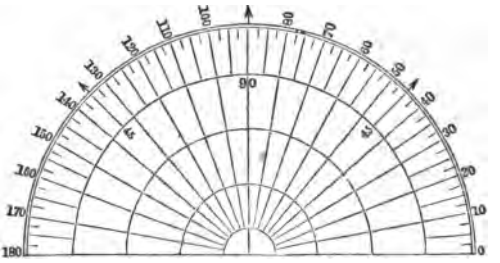
Suppose the longer diameter 6 inches and the shorter diameter 4 inches; then 6 added to 4 equal 10, divided by 2 equal 5, multiplied by 3·1416 equal 15·7080 inches circumference.

TO CONSTRUCT THE FRUSTRUM OF A CONE.

Form of flat Plate by which to construct any Frustrum of a Cone



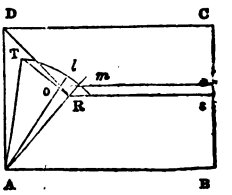
Let A B C D represent the required frustrum: continue the lines A D and B C until they meet at E; then from E as centre, with the radius E C, describe the arc C H; also from E, with the radius E B, describe the arc B I; make B I equal in length to twice A G B, draw the line E I, and B C I H is the form of the plate as required.



Sector from which angles may be obtained.

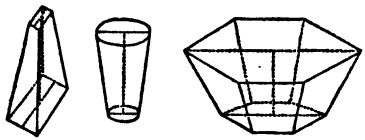
HIPPED ROOFS, MILL HOPPERS, &c.

To find the various Angles and proper Dimensions of Materials whereby to construct any figure whose form is the Frustrum of a proper or Inverted Pyramid, as Hipped Roofs, Mill Hoppers, &c.



Let A B C D be the given dimensions of plan for a roof, the height R T also being given; draw the diagonal A R, meeting the top or ridge R *s* on plan; from R, at right angles with A R and equal to the required height, draw the line R T, then T A, equal the length of the struts or corners of the roof; from A, with the distance A T, describe an arc T *l*, continue the diagonal A R until it cuts the arc T *l*, through which, and parallel with the ridge R *s*, draw the line *m n*, which determines the required breadth for each side of the roof from A, meeting the line *m n*, draw the line A *o*, or proper angle for the end of each board by which the roof might require to be covered; and the angle at T is what the boards require to be made in the direction of their thickness, when the corners or angles require to be mitred.

CONTENTS IN GALLONS OF THE FRUSTRUM OF A CONE



To find the Contents in Gallons of a Vessel, whose diameter is larger at one end than the other, such as a Bowl, Pail, Tub, Firken, Coffee-pot, &c.

Rule. — Multiply the larger diameter by the smaller, and to the product add ⅓ of the square of their difference, multiply by the height, and multiply that product by .0034 for Wine Gallons, and by .002785 for Beer.

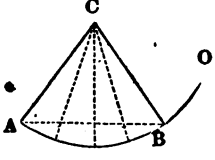
EXAMPLE. — Required the contents of a Coffee-pot 6 inches diameter at the top, 9 inches at the bottom, and 18 inches high?

diameter	6	brought up	1026
do.	9		.0034
	54		4104
⅓ of the square	3		3078
	57		3.4884 Wine Gallons, or
height	18		[nearly 3½ gallons.
	456		
	57		
Carried up	1026		

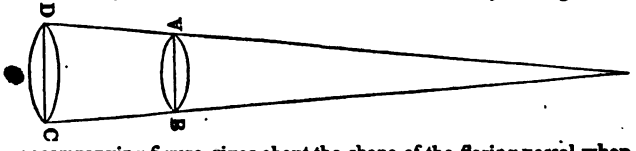
1026 multiplied by .002785 equal 2.8574 *Beer Gallons.*

RULE FOR STRIKING OUT A CONE, OR FRUSTRUM.

In a conical surface, there may be economy, sometimes, in having the slant height 6 times the radius of base. For, a Circle may be wholly cut into conical surfaces, if the angle is 60°, 30°, 15°, &c.



But there is a greater simplicity in cutting it, when the angle is 60°. For instance, take A C equal to the slant height, describe an indefinite arc A O; with the same opening of the dividers measure from A to B; draw B C and we have the required sector. This would make the angle C equal 60°. This angle may be divided into two or four equal parts, and we should thus have sectors whose angle would be 30° or 15°, which would not make the vessel very flaring. The



accompanying figure gives about the shape of the flaring vessel when the angle of the sector is 30°.

COMPOSITIONS AND ALLOYS.

Receipts for the use of Mechanists, Iron and Brass Founders, Tinmen, Coppersmiths, Turners, Dentists, Finishers of Brass, Britannia, and German Silver, and for other useful and important purposes in the Practical Arts.

The larger number of the following Receipts are the result of inquiries and experiments by a practical operative. Most of those which relate to the mixing of metals and to the finishing of manufactured articles, have been thoroughly tested by him, and will be found to produce the results desired and expected. The others have been collected from eminent scientific works.

No. 1. YELLOW BRASS, *for Turning.—(Common article.)*—Copper, 20 lbs.; Zinc, 10 lbs.; Lead from 1 to 5 ozs.
Put in the Lead last before pouring off.

No. 2. RED BRASS, *for Turning.*—Copper, 24 lbs.; Zinc, 5 lbs.; Lead, 8 ozs.
Put in the Lead last before pouring off.

No. 3. RED BRASS, *free, for Turning.*—Copper, 160 lbs.; Zinc, 50 lbs.; Lead, 10 lbs.; Antimony, 44 ozs.

No. 4. ANOTHER BRASS, *for Turning.*—Copper, 32 lbs.; Zinc, 10 lbs.; Lead, 1 lb.

No. 5. BEST RED BRASS, *for Fine Castings.*—Copper, 24 lbs.; Zinc, 5 lbs.; Bismuth, 1 oz.
Put in the Bismuth last before pouring off.

No. 6. BRONZE METAL.—Copper, 7 lbs.; Zinc, 3 lbs.; Tin, 2 lbs.

No. 7. BRONZE METAL.—Copper, 1 lb.; Zinc, 12 lbs.; Tin, 8 lbs.

No. 8. BELL METAL, *for large Bells.*—Copper, 100 lbs.; Tin, from 20 to 25 lbs.

No. 9. BELL METAL, *for small Bells.*—Copper, 3 lbs.; Tin, 1 lb.

No. 10. COCK METAL.—Copper, 20 lbs.; Lead, 8 lbs.; Litharge, 1 oz.; Antimony, 3 ozs.

No. 11. HARDENING FOR BRITANNIA.—*(To be mixed separately from the other ingredients)*—Copper, 2 lbs.; Tin, 1 lb.

No. 12. GOOD BRITANNIA METAL.—Tin, 150 lbs.; Copper, 3 lbs.; Antimony, 10 lbs.

No. 13. BRITANNIA METAL, *2d quality.*—Tin, 140 lbs.; Copper, 3 lbs.; Antimony, 9 lbs.

No. 14. BRITANNIA METAL, *for Casting.*—Tin, 210 lbs.; Copper, 4 lbs.; Antimony, 12 lbs.

No. 15. BRITANNIA METAL, *for Spinning.*—Tin, 100 lbs.; Britannia Hardening, 4 lbs.; Antimony, 4 lbs.

No. 16. BRITANNIA METAL, *for Registers.*—Tin, 100 lbs.; Hardening, 8 lbs.; Antimony, 8 lbs.

No. 17. BEST BRITANNIA, *for Spouts.*—Tin, 140 lbs.; Copper, 3 lbs.; Antimony, 6 lbs.

No. 18. BEST BRITANNIA, *for Spoons.*—Tin, 100 lbs.; Hardening, 5 lbs.; Antimony, 10 lbs.

No. 19. BEST BRITANNIA, *for Handles.*—Tin, 140 lbs.; Copper, 2 lbs.; Antimony, 5 lbs.

No. 20. BEST BRITANNIA, *for Lamps, Pillars, and Spouts.*—Tin, 300 lbs.; Copper, 4 lbs.; Antimony, 15 lbs.

No. 21. CASTING—Tin, 100 lbs; Hardening, 5 lbs.; Antimony, 5 lbs.

No. 22. LINING METAL, *for Boxes of Railroad Cars.* - Mix Tin, 24 lbs.; Copper, 4 lbs.; Antimony, 8 lbs.(for a hardening); then add Tin, 72 lbs.

No. 23. FINE SILVER COLORED METAL.—Tin, 100 lbs.; Antimony, 8 lbs.; Copper, 4 lbs.; Bismuth, 1 lb.

No. 24. GERMAN SILVER, *First Quality for Casting.*—Copper, 50 lbs.; Zinc, 25 lbs.; Nickel, 25 lbs.

No. 25. GERMAN SILVER, *Second Quality for Casting.*—Copper, 50 lbs.; Zinc, 20 lbs.; Nickel, (best pulverized,) 10 lbs.

No. 26. GERMAN SILVER, *for Rolling.*—Copper, 60 lbs.; Zinc, 20 lbs.; Nickel, 25 lbs.

No. 27. GERMAN SILVER, *for Bells and other Castings.*—Copper, 60 lbs.; Zinc, 20 lbs.; Nickel, 20 lbs.; Lead, 3 lbs.; Iron, (that of tin plate being best,) 2 lbs.

No. 28 IMITATION OF SILVER.—Tin, 3 ozs.; Copper, 4 lbs.

No. 29. PINCHBECK.—Copper, 5 lbs.; Zinc, 1 lb.

No. 30. TOMBAC.—Copper, 16 lbs.; Tin, 1 lb.; Zinc, 1 lb.

No. 31. RED TOMBAC.—Copper, 10 lbs.; Zinc, 1 lb.

No 32. HARD WHITE METAL.—Sheet Brass, 32 ozs.; Lead, 2 ozs.; Tin, 2 ozs.; Zinc, 1 oz.

No. 33. METAL FOR TAKING IMPRESSIONS.—Lead, 3 lbs.; Tin, 2 lbs.; Bismuth, 5 lbs.

No. 34. SPANISH TUTANIA.—Iron or Steel, 8 ozs.; Antimony, 16 ozs.; Nitre. 3 ozs.

Melt and harden 8 ozs. Tin with 1 oz. of the above compound.

No. 35. ANOTHER TUTANIA.—Antimony, 4 ozs.; Arsenic, 1 oz.; Tin, 2 lbs.

No. 36. GUN METAL.—Bristol Brass, 112 lbs.; Zinc, 14 lbs.; Tin, 7 lbs.

No. 37. RIVET METAL.—Copper, 32 ozs.; Tin, 2 ozs.; Zinc, 1 oz.

No. 38. RIVET METAL, *for Hose.*—Tin, 64 lbs.; Copper, 1 lb.

No. 39. FUSIBLE ALLOY, *(which melts in boiling water.)*—Bismuth, 8 ozs.; Tin, 3 ozs.; Lead, 5 ozs.

No. 40. FUSIBLE ALLOY, *for Silvering Glass.*—Tin, 6 ozs.; Lead, 10 ozs.; Bismuth, 21 ozs.; Mercury, a small quantity.

No. 41. SOLDER, *for Gold.*—Gold, 6 pwts.; Silver, 1 pwt.; Copper, 2 pwts.

No. 42. SOLDER, *for Silver.—(For the use of Jeweller.s)*—Fine Silver, 19 pwts; Copper, 1 pwt.; Sheet Brass, 10 pwts.

No. 43. WHITE SOLDER, *for Silver.*—Silver, 1 oz.; Tin, 1 oz.

No. 44. WHITE SOLDER, *for raised Britannia Ware.*—Tin, 100 lbs.; Copper, 3 ozs.; to make it free, add Lead, 3 ozs.

No 45. BEST SOFT SOLDER, *for Cast Britannia Ware.*—Tin, 8 lbs.; Lead, 5 lbs.

No. 46. YELLOW SOLDER, *for Brass or Copper.*—Copper, 1 lb.; Zinc, 1 lb.

No. 47. YELLOW SOLDER, *for Brass or Copper.* — *(Stronger than the last.)* — Copper, 32 lbs.; Zinc, 29 lbs.; Tin, 1 lb.

No. 48. SOLDER, *for Copper.* — Copper, 10 lbs.; Zinc, 9 lbs.

No. 49. BLACK SOLDER. — Copper, 2 lbs.; Zinc, 3 lbs; Tin, 2 ozs.

No. 50. BLACK SOLDER. — Sheet Brass, 20 lbs.; Tin, 6 lbs.; Zinc, 1 lb.

No. 51. SOFT SOLDER. — Tin, 15 lbs.; Lead, 15 lbs.

No. 52. SILVER SOLDER, *for Plated Metal.* — Fine Silver, 1 oz.; Brass, 10 pwts.

No. 53. YELLOW DIPPING METAL. — Copper, 32 lbs.; Zinc, 2 lbs.; Soft Soder, 2½ ozs.

No. 54. QUICK BRIGHT DIPPING ACID, *for Brass which has been ormeloed.* — Sulphuric Acid, 1 gall.; Nitric Acid, 1 gall.

No. 55. DIPPING ACID. — Sulphuric Acid, 12 lbs.; Nitric Acid, 1 pint; Nitre, 4 lbs.; Soot, 2 handfuls; Brimstone, 2 ozs.
Pulverize the Brimstone and soak it in water an hour. Add the Nitric Acid last.

No. 56. GOOD DIPPING ACID, *for Cast Brass.* — Sulphuric Acid, 1 qt., Nitre, 1 qt.; Water, 1 qt.
A little Muriatic Acid may be added or omitted.

No. 57. DIPPING ACID. — Sulphuric Acid, 4 galls.; Nitric Acid, 2 galls.; Saturated solution of Sulphate of Iron (Copperas), 1 pint; Solution of Sulphate of Copper, 1 qt.

No. 58. ORMELO DIPPING ACID, *for Sheet Brass.* — Sulphuric Acid, 2 galls.; Nitric Acid, 1 pt.; Muriatic Acid, 1 pt.; Water, 1 pt.; Nitre, 12 lbs.
Put in the Muriatic Acid last, a little at a time and stir the mixture with a stick.

No. 59. ORMELO DIPPING ACID, *for Sheet or Cast Brass.* — Sulphuric Acid, 1 gall; Sal Ammoniac, 1 oz.; Sulphur, (in flour,) 1 oz.; Blue Vitriol, 1 oz.; Saturated Solution of Zinc in Nitric Acid, mixed with an equal quantity of Sulphuric Acid, 1 gall.

No. 60. TO PREPARE BRASS WORK FOR ORMELO DIPPING. — If the work is oily, boil it in lye; and if it is finished work, filed or turned, dip it in old acid, and it is then ready to be ormeloed; but if it is unfinished, and free from oil, pickle it in strong sulphuric acid, dip in pure nitric acid, and then in the old acid, after which it will be ready for ormeloing.

No. 61. TO REPAIR OLD NITRIC ACID ORMELO DIPS. — If the work after dipping appears coarse and spotted, add vitriol till it answers the purpose. If the work after dipping appears too smooth, add muriatic acid and nitre till it gives the right appearance.

The other ormelo dipps should be repaired according to the receipts, putting in the proper ingredients to strengthen them. They should not be allowed to settle, but should be stirred often while using.

No. 62. TINNING AICD, *for Brass or Zinc.* — Muriatic Acid, 1 qt.; Zinc, 6 ozs. To a solution of this add, Water, 1 qt.; Sal Ammoniac, 2 ozs.

No. 63. VINEGAR BRONZE, *for Brass.* — Vinegar, 10 galls.; Blue Vitriol, 3 lbs.; Muriatic Acid. 3 lbs.; Corrosive Sublimate, 4 grs.; Sal Ammonia, 2 lbs.; Alum, 8 ozs.

No. 64. DIRECTIONS FOR MAKING LACQUER. — Mix the ingredients and let the vessel containing them stand in the sun, or in a place slightly warmed three or four days, shaking it frequently till the gum is dissolved, after which let it settle from twenty-four to forty-eight hours, when the clear liquor may be poured off for use. Pulverized glass is sometimes used in making Lacquer, to carry down the impurities.

No. 65. LACQUER, *for Dipped Brass.* — Alcohol, proof specific gravity

not less than 95-100ths, 2 galls.; Seed Lac, 1 lb.; Gum Copal, 1 oz.; English Saffron, 1 oz.; Annotto, 1 oz.

No. 66. LACQUER, *for Bronzed Brass.*—To one pint of the above Lacquer, add, Gamboge, 1 oz.; and after mixing it add an equal quantity of the first Lacquer.

No. 67. DEEP GOLD COLORED LACQUER.—Best Alcohol, 40 ozs.; Spanish Annotto, 6 grs.; Turmeric, 2 drs.; Shell Lac, ½ oz.; Red Sanders, 12 grs.; when dissolved add Spirits of Turpentine, 30 drops.

No. 68. GOLD COLORED LACQUER, *for Brass not Dipped.*—Alcohol, 4 galls.; Turmeric, 3 lbs.; Gamboge, 3 ozs.; Gum Sanderach, 7 lbs.; Shell Lac, 1½ lb.; Turpentine Varnish, 1 pint.

No. 69. GOLD COLORED LACQUER, *for Dipped Brass.*—Alcohol, 36 ozs.; Seed Lac, 6 ozs.; Amber, 2 ozs.; Gum Gutta, 2 ozs.; Red Sandal Wood, 24 grs.; Dragon's Blood, 60 grs.; Oriental Saffron, 36 grs.; Pulverized Glass, 4 ozs.

No. 70. GOOD LACQUER, *for Brass.*—Seed Lac, 6 ozs.; Amber or Copal, 2 ozs.; Best Alcohol, 4 galls.; Pulverized Glass, 4 ozs.; Dragon's Blood, 40 grs.; Extract of Red Sandal Wood obtained by water, 30 grs.

No. 71. LACQUER, *for Dipped Brass.*—Alcohol, 12 galls.; Seed Lac, 9 lbs.; Turmeric, 1 lb. to a gallon of the above mixture; Spanish Saffron, 4 ozs.

The Saffron is to be added for Bronze work.

No. 72. GOOD LACQUER.—Alcohol, 8 ozs.; Gamboge, 1 oz.; Shell Lac, 3 ozs.; Annotto, 1 oz.; solution of 3 ozs. of Seed Lac in 1 pint of Alcohol; when dissolved add ½ oz. Venice Turpentine, ½ oz. Dragon's Blood, will make it dark; keep it in a warm place four or five days.

No. 73. PALE LACQUER, *for Tin Plate.*—Best Alcohol, 8 ozs.; Turmeric, 4 drs.; Hay Saffron, 2 scs.; Dragon Blood, 4 scs.; Red Sanders, 1 sc.; Shell Lac, 1 oz.; Gum Sanderach, 2 drs.; Gum Mastic, 2 drs.; Canada Balsam, 2 drs.; when dissolved add Spirits of Turpentine, 80 drops.

No. 74. RED LACQUER, *for Brass.*—Alcohol, 8 galls.; Dragon's Blood, 4 lbs.; Spanish Annotto, 12 lbs., Gum Sanderach, 13 lbs.; Turpentine, 1 gall.

No. 75. PALE LACQUER, *for Brass.*—Alcohol, 2 galls.; Cape loes, cut small, 3 ozs.; Pale Shell Lac, 1 lb.; Gamboge, 1 oz.

No. 76. BEST LACQUER, *for Brass.*—Alcohol, 4 galls.; Shell Lac, 2 lbs.; Amber Gum, 1 lb.; Copal, 20 ozs.; Seed Lac, 3 lbs.; Saffron, to color; Pulverized Glass, 8 ozs.

No. 77. COLOR FOR LACQUER.—Alcohol, 1 qt.; Annotto, 4 ozs.

No. 78. LACQUER, *for Philosophical Instruments*—Alcohol, 80 ozs.; Gum Gutta, 3 ozs.; Gum Sanderach, 8 ozs.; Gum Elemi, 8 ozs.; Dragon's Blood, 4 ozs; Seed Lac, 4 ozs.; Terra Merita, 3 ozs.; Saffron, 8 grs.; Pulverized Glass, 12 ozs.

No. 79. BROWN BRONZE DIP.—Iron Scales, 1 lb.; Arsenic, 1 oz. Muriatic Acid, 1 lb.; Zinc, (solid,) 1 oz.

Let the Zinc be kept in only while it is in use.

No. 80. GREEN BRONZE DIP.—Wine Vinegar, 2 qts.; Verditer Green, 2 ozs.; Sal Ammoniac, 1 oz; Salt, 2 ozs.; Alum, ½ oz.; French Berries, 8 ozs.; boil the ingredients together.

No. 81. AQUAFORTIS BRONZE DIP.—Nitric Acid, 8 ozs.; Muriatic Acid, 1 qt.; Sal Ammoniac, 2 ozs.; Alum, 1 oz.; Salt, 2 ozs.; Water, 2 galls.

Add the Salt after boiling the other ingredients, and use it hot.

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No. 82. OLIVE BRONZE DIP, *for Brass.*—Nitric Acid, 3 ozs; Muriatic Acid, 2 ozs.; add Tillatinum or Pillanium; when the metal is dissolved add 2 galls. pure soft water to each pint of the solution.

No. 83. BROWN BRONZE PAINT, *for Copper Vessels.*—Tincture of Steel, 4 ozs.; Spirits of Nitre, 4 ozs.; Essence of Dendi, 4 ozs.; Blue Vitriol, 1 oz.; Water, ½ pint.

Mix in a bottle. Apply it with a fine brush, the vessel being full of boiling water Varnish after the application of the bronze.

No. 84. BRONZE, *for all kinds of Metal.*—Muriate of Ammonia (Sal Ammoniac), 4 drs.; Oxalic Acid, 1 dr.; Vinegar, 1 pint.

Dissolve the Oxalic Acid first. Let the work be clean. Put on the bronze with a brush, repeating the operation as many times as may be necessary.

No. 85. BRONZE PAINT, *for Iron or Brass.*—Chrome Green, 2 lbs.; Ivory Black, 1 oz.; Chrome Yellow, 1 oz.; Good Japan, 1 gill; grind all together and mix with Linseed Oil.

No. 86. TO BRONZE GUN BARRELS.—Dilute Nitric Acid with Water and rub the gun barrels with it; lay them by for a few days, then rub them with Oil and polish them with bees-wax.

No. 87. FOR TINNING BRASS.—Water, 2 pails full; Cream of Tartar, 1-2 lb.; Salt, 1-2 pint.

Shaved or Grained Tin.—Boil the work in the mixture, keeping it in motion during the time of boiling.

No. 88. SILVERING BY HEAT.—Dissolve 1 oz. of Silver in Nitric Acid; add a small quantity of Salt; then wash it and add Sal Ammoniac, or 6 ozs. of Salt and White Vitriol; also ½ oz. of Corrosive Sublimate, rub them together till they form a paste, rub the piece which is to be Silvered with the paste, heat it till the Silver runs, after which dip it in a weak vitriol pickle to clean it.

No. 89. MIXTURE FOR SILVERING.—Dissolve 2 ozs. of Silver with 3 grains of Corrosive Sublimate; add Tartaric Acid, 4 lbs.; Salt, 8 qts.

No. 90. SEPARATE SILVER FROM COPPER.—Mix Sulphuric Acid, 1 part; Nitric Acid, 1 part; Water, 1 part; boil the metal in the mixture till it is dissolved, and throw in a little Salt to cause the Silver to subside.

No. 91. SOLVENT FOR GOLD.—Mix equal quantities of Nitric and Muriatic Acids.

No. 92. VARNISH, *for Smooth Moulding Patterns.*—Alcohol, 1 gall.; Shell Lac, 1 lb.; Lamp or Ivory Black, sufficient to color it.

No 93. FINE BLACK VARNISH, *for Coaches.*—Melt in an Iron pot, Amber, 32 ozs.; Resin, 6 ozs.; Asphaltum, 6 ozs.; Drying Linseed Oil, 1 pt.; when partly cooled add Oil of Turpentine, wormed, 1 pt.

No. 94. CHINESE WHITE COPPER.—Copper, 40.4; Nickel, 31.6; Zinc, 25.4; and Iron, 2.6 parts.

No. 95. MANHEIM GOLD.—Copper, 3; Zinc, 1 part; and a small quantity of Tin.

No. 96. ALLOY OF THE STANDARD MEASURES USED BY THE BRITISH GOVERNMENT.—Copper, 576; Tin, 59; and Brass, 48 parts.

No. 97. BATH METAL.—Brass, 32; and Zinc, 9 parts.

No. 98. SPECULUM METAL.—Copper, 6; Tin, 2; and Arsenic, 1 part. Or, Copper, 7; Zinc, 3; and Tin, 4 parts.

No. 99. HARD SOLDER.—Copper, 2; Zinc, 1 part.

No. 100. BLANCHED COPPER.—Copper, 8; and Arsenic, ½ part.

No. 101. BRITANNIA METAL.—Brass, 4; Tin, 4 parts; when fused, add Bismuth, 4; and Antimony, 4 parts.

This composition is added at discretion to melted Tin.

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No. 102. PLUMBER'S SOLDER.—Lead, 1; Tin, 1 part.

No. 103. TINMAN'S SOLDER.—Lead, 2; Tin, 1 part.

No. 104. PEWTERER'S SOLDER.—Tin, 2; Lead, 1 part.

No. 105. COMMON PEWTER.—Tin, 4; Lead, 1 part.

No. 106. BEST PEWTER.—Tin, 100; Antimony, 17 parts.

No. 107. A METAL THAT EXPANDS IN COOLING.—Lead, 9; Antimony, 2; Bismuth, 1 part.

This Metal is very useful in filling small defects in Iron castings, &c.

No. 108. QUEEN'S METAL.—Tin, 9; Antimony, 1; Bismuth, 1; Lead, 1 part.

No. 109. MOCK PLATINUM.—Brass, 8; Zinc, 5 parts.

No. 110. SILVER COIN OF THE UNITED STATES.—Pure Silver, 9; Alloy, 1 part; the alloy of silver is fine copper.

No. 111. GOLD COIN OF THE UNITED STATES.—Pure Gold, 9; Alloy. 1 part; the alloy of gold is $\frac{1}{4}$ silver and $\frac{3}{4}$ copper, (not to exceed $\frac{1}{2}$ silver).

No. 112. SILVER COIN OF GREAT BRITAIN.—Pure Silver, 11.1; Copper, 9.9 parts.

No. 113. GOLD COIN OF GREAT BRITAIN.—Pure Gold, 11; Copper, 1 part.

Previous to 1826 Silver formed part of the alloy of Gold coin; hence the different color of English Gold money.

No. 114. RING GOLD.—Pure Copper, 6$\frac{1}{2}$ pwts.; Fine Silver, 3$\frac{1}{2}$ pwts.; Pure Gold, 1 oz. and 5 pwts.

No. 115. MOCK GOLD.—Fuse together Copper, 16; Platinum, 7; Zinc, 1 part.

When Steel is alloyed with 1-500 part of Platinum, or with 1-500 part of Silver, it is rendered much harder, more malleable, and better adapted for every kind of cutting instrument.

NOTE.—In making alloys, care must be taken to have the more infusible metals melted first, and afterwards add the others.

No. 116. COMPOSITION USED IN WELDING CAST STEEL.—Borax, 10; Sal Ammoniac, 1 part; grind or pound them roughly together; then fuse them in a metal pot over a clear fire, taking care to continue the heat until all spume has disappeared from the surface. When the liquid appears clear, the composition is ready to be poured out to cool and concrete; afterwards being ground to a fine powder, it is ready for use.

To use this composition, the Steel to be welded is raised to a heat which may be expressed by "bright yellow;" it is then dipped among the welding powder, and again placed in the fire until it attains the same degree of heat as before, it is then ready to be placed under the hammer.

No 117. CAST IRON CEMENT.—Clean borings, or turnings, of Cast Iron, 16; Sal Ammoniac, 2; Flour of Sulphur, 1 part; mix them well together in a mortar and keep them dry. When required for use, take of the mixture, 1; clean borings, 20 parts; mix thoroughly, and add a sufficient quantity of water.

A little grindstone dust added improves the cement.

No. 118. BOOTH'S PATENT GREASE, *for Railway Axles.*—Water, 1 gall.; Clean Tallow, 3 lbs.; Palm Oil, 6 lbs.; Common Soda, $\frac{1}{4}$ lb. Or, Tallow, 8 lbs.; Palm Oil. 10.

The mixture to be heated to about 210° F., and well stirred till it cools down to about 70°, when it is ready for use.

No. 119. CEMENT, *for Steam-pipe Joints, &c., with Faced Flanges.*—White Lead, mixed, 2; Red Lead, dry, 1 part; grind or otherwise mix them to a consistence of thin putty, apply interposed layers with one or two thicknesses of canvas or gauze wire, as the necessity of the case may be.

No. 120. SOFT CEMENT, *for Steam-boilers, Steam-pipes, &c.* — Red or White Lead, in oil, 4; Iron borings, 2 to 3 parts.

No. 121. HARD CEMENT. — Iron Borings and Salt Water, and a small quantity of Sal Ammoniac with Fresh Water.

No. 123. STAINING WOOD AND IVORY.— *Yellow.*— Dilute Nitric Acid will produce it on wood.

Red. — An infusion of Brazil Wood in stale urine, in the proportion of a pound to a gallon for wood; to be laid on when boiling hot, and should be laid over with alum water before it dries. Or, a solution of Dragon's Blood in spirits of wine, may be used.

Black. — Strong solution of Nitric Acid, for wood or ivory.

Mahogany. — Brazil, Madder, and Logwood, dissolved in water and put on hot.

Blue. — Ivory may be stained thus: Soak it in a solution of Verdigris in Nitric Acid, which will turn it *green*; then dip it into a solution of Pearlash boiling hot.

Purple. — Soak ivory in a solution of Sal Ammoniac into four times its weight of Nitrous Acid.

TABLE OF ALLOYS.

Alloys having a density greater than the Mean of their Constituents.		Alloys having a density less than the Mean of their Constituents.	
Gold and zinc.	Silver & antimony.	Gold and silver	Iron and bismuth.
Gold and tin.	Copper and zinc.	Gold and iron.	Iron and antimony.
Gold and bismuth.	Copper and tin.	Gold and lead.	Iron and lead.
Gold and antimony.	Copper and palladium.	Gold and copper.	Tin and lead.
Gold and cobalt.	Copper & bismuth.	Gold and iridium.	Tin and palladium.
Silver and zinc.	Lead and antimony	Gold and nickel.	Tin and antimony.
Silver and lead.	Platinum & molybdenum.	Silver and copper.	Nickel and arsenic.
Silver and tin.		Silver and lead.	Zinc and antimony.
Silver and bismuth.	Palladium and bismuth.		

ALLOYS OF COPPER AND ZINC, AND OF COPPER AND TIN.

Composition by Weight per cent.	Specific Gravity.	Colour.	Ultimate Cohesive Strength of an in. square Bar, in Tons.	Characteristic Properties, &c.
Copper	8667	Tile red.	24.6	Malleable.
100 00 Zinc	6895	Bluish grey.	15.2	Brittle.
83.02+16.98	8415	Yellowish red.	13.7	Bath metal.
79.65+20.35	8448	do. do.	14.7	Dutch brass.
74.58+25.42	8397	Pale yellow.	13.1	Rolled sheet brass.
66.18+33.82	8299	Full yellow.	12.5	British brass.
49 47+50.53	8230	do. do.	9.2	German brass.
32.55+67.15	8283	Deep yellow.	19.3	Watchmakers' brass.
30 30+69.70	7836	Silver white.	2.2	Very brittle.
24.50+75.50	7449	Ash grey.	3.1	Brittle.
19.65+80.35	7371	do.	1.9	White button metal.
Tin	7291	White.	2.7	
84.29+15.71	8561	Reddish yellow.	16.1	Gun metal.
81.10+18.90	8459	Yellowish red.	17.7	Gun metal and bronze.
78.97+21.03	8728	do. do.	13.6	Hard, mill brasses.
31.92+65.08	9065	White.	1.4	Small bells.
15.17+84.83	7447	Very white.	3.1	Speculum metal.
11.82+88.18	7472	do. do.	3.1	Files, tough.

NOTE.—No simple binary alloy of copper and zinc, or of copper and tin, works as pleasantly in turning, planing, or filing, as if combined with a small proportion of a third fusible metal, generally lead is added to copper and zinc, and zinc to copper and tin.

To Polish Brass.— When the Brass is made smooth by turning or filing with a very fine file, it may be rubbed with a smooth fine grained stone, or with charcoal and water. When it is made quite smooth and free from scratches it may be polished with rotten stone and oil, alcohol or spirits of turpentine.

To Clean Brass.— If there is any oily substance on the Brass boil it in a solution of potash, or strong lye. Mix equal quantities of Nitric and Sulphuric Acids in a stone or earthern vessel, let it stand a few hours, stirring it occasionally with a stick, then dip the Brass in the solution, but take it out immediately and rinse it in soft water, and wipe it in saw dust till it is dry.

Glue.— Powdered Chalk added to common Glue strengthens it. A Glue which will resist the action of water is made by boiling 1 pound of Glue in 2 quarts of skimmed Milk.

ALLOYS FOR BRONZE.

Professor Hoffman, of the Prussian artillery, has made experiments with the view of obtaining a good statuary bronze, and recommends the alloys ranging between the two following admixtures:—

1st. To produce the reddest bronze.

88.75 Copper Zinc (7 atoms copper, 1 atom zinc).
11.25 Copper Tin (3 atoms copper, 1 atom tin).

100·00

2nd. To produce a cheap bronze, with a bright yellow color, almost golden.

93.5 Copper Zinc (2 atoms copper, 1 atom zinc).
6.5 Copper Tin (3 atoms copper, 1 atom tin).

100.0

VALUABLE ALLOYS.

The "Paris Scientific Review" has published, for the benefit of the industrious workers in metals, the best receipts for composing all the various factitious metals used in the arts; the following are a few:—

Statuary Bronze.—Darcet has discovered that this is composed of copper, 91.4; zinc, 5.5; lead, 1.7; tin, 1.4.

Bronze for Cannon of Large Calibre.—Copper, 90; tin, 7.

Pinchbeck.—Copper, 5; zinc, 1.

Bronze for Cannon of Small Calibre.—Copper, 93; tin, 7.

Bronze for Medals.—Copper, 100; tin. 8.

Alloy for Cymbals.—Copper, 80; tin, 20.

Metal for the Mirrors of Reflecting Telescopes.—Copper, 100; tin. 50.

White Argentan.—Copper, 8; nickel, 3; zinc, 35; this beautiful composition is in imitation of silver.

Chinese Silver.—M. Mairer discovered the following proportions:—Silver, 2.5; copper, 65.24; zinc, 19.52; nickel, 13; cobalt of iron, 0.12.

Tutenag.—Copper, 8; nickel, 3; zinc, 5.

Printing Characters.—Lead, 4; antimony, 1. For stereotype plates—Lead, 9; antimony, 2; bismuth, 2.

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3	·6	·9	·12	·15	·18	·18¾	·21	·24	·27	·30	·33	·36	·37½	·39	·42
4	·8	·12	·16	·20	·24	·25	·28	·32	·36	·40	·44	·48	·50	·52	·56
5	·10	·15	·20	·25	·30	·31¼	·35	·40	·45	·50	·55	·60	·62½	·65	·70
6	·12	·18	·24	·30	·36	·37½	·42	·48	·54	·60	·66	·72	·75	·78	·84
7	·14	·21	·28	·35	·42	·43¾	·49	·56	·63	·70	·77	·84	·87½	·91	·98
8	·16	·24	·32	·40	·48	·50	·56	·64	·72	·80	·88	·96	1·00	1·04	1·12
9	·18	·27	·36	·45	·54	·56¼	·63	·72	·81	·90	·99	1·08	1·12½	1·17	1·26
10	·20	·30	·40	·50	·60	·62½	·70	·80	·90	1·00	1·10	1·20	1·25	1·30	1·40
11	·22	·33	·44	·55	·66	·68¾	·77	·88	·99	1·10	1·21	1·32	1·37½	1·43	1·54
12	·24	·36	·48	·60	·72	·75	·84	·96	1·08	1·20	1·32	1·44	1·50	1·56	1·68
13	·26	·39	·52	·65	·78	·81¼	·91	1·04	1·17	1·30	1·43	1·56	1·62½	1·69	1·82
14	·28	·42	·56	·70	·84	·87½	·98	1·12	1·26	1·40	1·54	1·68	1·75	1·82	1·96
15	·30	·45	·60	·75	·90	·93¾	1·05	1·20	1·35	1·50	1·65	1·80	1·87½	1·95	2·10
16	·32	·48	·64	·80	·96	1·00	1·12	1·28	1·44	1·60	1·76	1·92	2·00	2·08	2·24
17	·34	·51	·68	·85	1·02	1·06¼	1·19	1·36	1·53	1·70	1·87	2·04	2·12½	2·21	2·38
18	·36	·54	·72	·90	1·08	1·12½	1·26	1·44	1·62	1·80	1·98	2 16	2·25	2·34	2·52
19	·38	·57	·76	·95	1·14	1·18¾	1·33	1·52	1·71	1·90	2·09	2·28	2·37½	2·47	2·66
20	·40	·60	·80	1·00	1·20	1·25	1·40	1·60	1·80	2·00	2·20	2 40	2·50	2·60	2·80
21	·42	·63	·84	1·05	1·26	1·31¼	1·47	1·68	1·89	2·10	2·31	2·52	2·62½	2·73	2·94
22	·44	·66	·88	1·10	1·32	1·37½	1·54	1·76	1·98	2·20	2·42	2 64	2·75	2·86	3·08
23	·46	·69	·92	1·15	1·38	1·43¾	1·61	1·84	2·07	2·30	2·53	2·76	2·87½	2·99	3·22
24	·48	·72	·96	1·20	1·44	1·50	1·68	1·92	2·16	2·40	2·64	2·88	3·00	3·12	3·36
25	·50	·75	1·00	1·25	1·50	1·56¼	1·75	2·00	2·25	2·50	2·75	3·00	3·12½	3·25	3·50
30	·60	·90	1·20	1·50	1·80	1·87½	2·10	2·40	2·70	3·00	3·30	3 60	3·75	3·90	4·20
40	·80	1·20	1·60	2·00	2·40	2·50	2·80	3·20	3·60	4·00	4·40	4 80	5·00	5·20	5·60
50	1·00	1·50	2·00	2·50	3·00	3·12½	3·50	4·00	4·50	5·00	5·50	6·00	6·25	6·50	7·00
60	1·20	1·80	2·40	3·00	3·60	3·75	4·20	4·80	5·40	6·00	6·60	7·20	7·50	7·80	8·40
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8	5·12	5·20	5·28	5·33⅓	5·36	5·44	5·52	5·60	5·68	5·76	5·84	5·92	6·00
9	5 76	5·85	5·94	6·00	6·03	6·12	6·21	6·30	6·39	6·48	6·57	6·66	6·75
10	6·40	6·50	6·60	6·66⅔	6·70	6·80	6·90	7·00	7·10	7·20	7·30	7·40	7·50
11	7·04	7·15	7·26	7·33⅓	7·37	7·48	7·59	7·70	7·81	7·92	8·03	8·14	8·25
12	7·68	7·80	7·92	8·00	8·04	8·16	8·28	8·40	8·52	8·64	8·76	8·88	9 00
13	8·32	8·45	8·58	8·66⅔	8·71	8 84	8·97	9·10	9·23	9·36	9·49	9·62	9·75
14	8·96	9·10	9·24	9·33⅓	9·38	9·52	9·66	9·80	9·94	10·08	10·22	10·36	10·50
15	9·60	9·75	9·90	10·00	10·05	10·20	10·35	10·50	10·65	10·80	10·95	11·10	11·25
16	10·24	10·40	10·56	10·66⅔	10·72	10·88	11·04	11·20	11·36	11·52	11·68	11·84	12·00
17	10·88	11·05	11·22	11·33⅓	11·39	11·56	11·73	11·90	12·07	12·24	12·41	12·58	12·75
18	11·52	11·70	11·88	12·00	12·06	12·24	12·42	12·60	12·78	12·96	13·14	13·32	13·50
19	12·16	12·35	12·54	12·66⅔	12·73	12·92	13·11	13·30	13·49	13·68	13·87	14·06	14·25
20	12·80	13·00	13·20	13·33⅓	13·40	13·60	13·80	14·00	14·20	14·40	14·60	14·80	15·00
21	13·44	13·65	13·86	14·00	14·07	14·28	14·49	14·70	14·91	15·12	15·33	15·54	15·75
22	14·08	14·30	14·52	14·66⅔	14·74	14·96	15·18	15·40	15·62	15·84	16·06	16·28	16·50
23	14·72	14·95	15·18	15·33⅓	15·41	15·64	15·87	16·10	16·33	16·56	16·79	17·02	17·25
24	15·36	15·60	15·84	16·00	16·08	16·32	16·56	16·80	17·04	17·28	17·52	17·76	18·00
25	16·00	16·25	16·50	16·66⅔	16·75	17·00	17·25	17·50	17·75	18·00	18·25	18·50	18·75
30	19·20	19·50	19·80	20·00	20·10	20·40	20·70	21·00	21·30	21·60	21·90	22·20	22·50
40	25·60	26·00	26·40	26·66⅔	26·80	27·20	27·60	28·00	28·40	28·80	29·20	29·60	30·00
50	32·00	32·50	33·00	33·33⅓	33·50	34·00	34·50	35·00	35·50	36·00	36·50	37·00	37·50
60	38·40	39·00	39·60	40·00	40·20	40·80	41·40	42·00	42·60	43·20	43·80	44·40	45·00
70	44·80	45·50	46·20	46·66⅔	46·90	47·60	48·30	49·00	49·70	50·40	51·10	51·80	52·50
80	51·20	52·00	52·80	53·33⅓	53·60	54·40	55·20	56·00	56·80	57·60	58·40	59·20	60·00
90	57·60	58·50	59·40	60·00	60·30	61·20	62·10	63·00	63·90	64·80	65·70	66·60	67·50
100	64·00	65·00	66·00	66·66⅔	67·00	68·00	69·00	70·00	71·00	72·00	73·00	74·00	75·00

If the Number required is not found in the Tables, add two Numbers together; for instance, if 35 bushels are required, add the prices opposite 30 and 5 together; and so for 365 bushels—treble the value of 100, and add 60 and 5 together.

Nos	76 ct.	77 ct.	78 ct.	79 ct.	80 ct.	81 ct.	82 ct.	83 ct.	84 ct.	85 ct.	86 ct.	87 ct.	87½ ct.	88 ct.
2	1·52	1·54	1·56	1·58	1·60	1·62	1·64	1·66	1·68	1·70	1·72	1·74	1·75	1·76
3	2·28	2·31	2·34	2·37	2·40	2·43	2·46	2·49	2·52	2·55	2·58	2·61	2·62½	2·64
4	3·04	3·08	3·12	3·16	3·20	3·24	3·28	3·32	3·36	3·40	3·44	3·48	3·50	3·52
5	3·80	3·85	3·90	3·95	4·00	4·05	4·10	4·15	4·20	4·25	4·30	4·35	4·37½	4·40
6	4·56	4·62	4·68	4·74	4·80	4·86	4·92	4·98	5·04	5·10	5·16	5·22	5·25	5·28
7	5·32	5·39	5·46	5·53	5·60	5·67	5·74	5·81	5·88	5·95	6·02	6·09	6·12½	6·16
8	6·08	6·16	6·24	6·32	6·40	6·48	6·56	6·64	6·72	6·80	6·88	6·96	7.00	7·04
9	6·84	6·93	7·02	7·11	7·20	7·29	7·38	7·47	7·56	7·65	7·74	7·83	7·87½	7·92
10	7·60	7·70	7·80	7·90	8·00	8·10	8·20	8·30	8·40	8·50	8·60	8·70	8·75	8·80
11	8·36	8·47	8·58	8·69	8·80	8·91	9·02	9·13	9·24	9·35	9·46	9·57	9·62½	9·68
12	9·12	9·24	9·36	9·48	9·60	9·72	9·84	9·96	10·08	10·20	10·32	10·44	10·50	10·56
13	9·88	10·01	10·14	10·27	10·40	10·53	10·66	10·79	10·92	11·05	11·18	11·31	11·37½	11·44
14	10·64	10·78	10·92	11·06	11·20	11·34	11·48	11·62	11·76	11·90	12·04	12·18	12·25	12·32
15	11·40	11·55	11·70	11·85	12·00	12·15	12·30	12·45	12·60	12·75	12·90	13·05	13·12½	13·20
16	12·16	12·32	12·48	12·64	12·80	12·96	13·12	13·28	13·44	13·60	13·76	13·92	14·00	14·08
17	12·92	13·09	13·26	13·43	13·60	13·77	13·94	14·11	14·28	14·45	14·62	14·79	14·87½	14·96
18	13·68	13·86	14·04	14·22	14·40	14·58	14·76	14·94	15·12	15·30	15·48	15·66	15·75	15·84
19	14·44	14·63	14·82	15·01	15·20	15·39	15·58	15·77	15·96	16·15	16·34	16·53	16·62½	16·72
20	15·20	15·40	15·60	15·80	16·00	16·20	16·40	16·60	16·80	17·00	17·20	17·40	17·50	17·60
21	15·96	16·17	16·38	16·59	16·80	17·01	17·22	17·43	17·64	17·85	18·06	18·27	18·37½	18·48
22	16·72	16·94	17·16	17·38	17·60	17·82	18·04	18·26	18·48	18·70	18·92	19·14	19·25	19·36
23	17·48	17·71	17·94	18·17	18·40	18·63	18·86	19·09	19·32	19·55	19·78	20·01	20·12½	20·24
24	18·24	18·48	18·72	18·96	19·20	19·44	19·68	19·92	20·16	20·40	20·64	20·88	21·00	21·12
25	19·00	19·25	19·50	19·75	20·00	20·25	20·50	20·75	21·00	21·25	21·50	21·75	21·87½	22·00
30	22·80	23·10	23·40	23·70	24·00	24·30	24·60	24·90	25·20	25·50	25·80	26·10	26·25	26·40
40	30·40	30·80	31·20	31·60	32·00	32·40	32·80	33·20	33·60	34·00	34·40	34·80	35·00	35·20
50	38·00	38·50	39·00	39·50	40·00	40·50	41·00	41·50	42·00	42·50	43·00	43·50	43·75	44·00
60	45·60	46·20	46·80	47·40	48·00	48·60	49·20	49·80	50·40	51·00	51·60	52·20	52·50	52·80
70	53·20	53·90	54·60	55·30	56·00	56·70	57·40	58·10	58·80	59·50	60·20	60·90	61·25	61·60
80	60·80	61·60	62·40	63·20	64·00	64·80	65·60	66·40	67·20	68·00	68·80	69·60	70·00	70·40
90	68·40	69·30	70·20	71·10	72·00	72·90	73·80	74·70	75·60	76·50	77·40	78·30	78·75	79·20
100	76·00	77·00	78·00	79·00	80·00	81·00	82·00	83·00	84·00	85·00	86·00	87·00	87·50	88·00

Nos	89 ct.	90 ct.	91 ct.	92 ct.	93 ct.	94 ct.	95 ct.	96 ct.	97 ct.	98 ct.	99 ct.	$1·	$2.	$3.
2	1·78	1·80	1·82	1·84	1·86	1·88	1·90	1·92	1·94	1·96	1·98	2·	4·	6·
3	2·67	2·70	2·73	2·76	2·79	2·82	2·85	2·88	2·91	2·94	2·97	3·	6·	9·
4	3·56	3·60	3·64	3·68	3·72	3·76	3·80	3·84	3·88	3·92	3·96	4·	8·	12·
5	4·45	4·50	4·55	4·60	4·65	4·70	4·75	4·80	4·85	4·90	4·95	5·	10·	15·
6	5·34	5·40	5·46	5·52	5·58	5·64	5·70	5·76	5·82	5·88	5·94	6·	12·	18·
7	6·23	6·30	6·37	6·44	6·51	6·58	6·65	6·72	6·79	6·86	6·93	7·	14·	21·
8	7·12	7·20	7·28	7·36	7·44	7·52	7·60	7·68	7·76	7·84	7·92	8·	16·	24·
9	8·01	8·10	8·19	8·28	8·37	8·46	8·55	8·64	8·73	8·82	8·91	9·	18·	27·
10	8·90	9·00	9·10	9·20	9·30	9·40	9·50	9·60	9·70	9·80	9·90	10·	20·	30·
11	9·79	9·90	10·01	10·12	10·23	10·34	10·45	10·56	10·67	10·78	10·89	11·	22·	33·
12	10·68	10·80	10·92	11·04	11·16	11·28	11·40	11·52	11·64	11·76	11·88	12·	24·	36·
13	11·57	11·70	11·83	11·96	12·09	12·22	12·35	12·48	12·61	12·74	12·87	13·	26·	39·
14	12·46	12·60	12·74	12·88	13·02	13·16	13·30	13·44	13·58	13·72	13·86	14·	28·	42·
15	13·35	13·50	13·65	13·80	13·95	14·10	14·25	14·40	14·55	14·70	14·85	15·	30·	45
16	14·24	14·40	14·56	14·72	14·88	15·04	15·20	15·36	15·52	15·68	15·84	16·	32·	48·
17	15·13	15·30	15·47	15·64	15·81	15·98	16·15	16·32	16·49	16·66	16·83	17·	34·	51
18	16·02	16·20	16·38	16·56	16·74	16·92	17.10	17·28	17·46	17·64	17·82	18·	36·	54·
19	16·91	17·10	17·29	17·48	17·67	17·86	18·05	18·24	18·43	18·62	18·81	19·	38·	57
20	17·80	18·00	18·20	18·40	18·60	18·80	19·00	19·20	19·40	19·60	19·80	20·	40·	60
21	18·69	18·90	19·11	19·32	19·53	19·74	19·95	20·16	20·37	20·58	20·79	21·	42·	63
22	19·58	19·80	20·02	20·24	20·46	20·68	20·90	21·12	21·34	21·56	21·78	22·	44·	66
23	20·47	20·70	20·93	21·16	21·39	21·62	21·85	22·08	22·31	22·54	22·77	23·	46·	69·
24	21·36	21·60	21·84	22·08	22·32	22·56	22·80	23·04	23·28	23·52	23·76	24·	48·	72
25	22·25	22·50	22·75	23·00	23·25	23·50	23·75	24·00	24·25	24·50	24·75	25·	50·	75
30	26·70	27·00	27·30	27·60	27·90	28·20	28·50	28·80	29·10	29·40	29·70	30·	60·	90
40	35·60	36·00	36·40	36·80	37·20	37·60	38·00	38·40	38·80	39·20	39·60	40·	80·	120
50	44·50	45·00	45·50	46·00	46·50	47·00	47·50	48·00	48·50	49·00	49·50	50·	100·	150
60	53·40	54·00	54·60	55·20	55·80	56·40	57·00	57·60	58·20	58·80	59·40	60·	120·	180·
70	62·30	63·00	63·70	64·40	65·10	65·80	66·50	67·20	67·90	68·60	69·30	70·	140·	210·
80	71·20	72·00	72·80	73·60	74·40	75·20	76·00	76·80	77·60	78·40	79·20	80·	160·	240·
90	80·10	81·00	81·90	82·80	83·70	84·60	85·50	86·40	87·30	88·20	89·10	90·	180·	270·
100	89·00	90·00	91·00	92·00	93·00	94·00	95·00	96·00	97·00	98·00	99.00	100·	200·	300·

WOOD AND BARK MEASUREMENT—AT SIGHT.

This Table is calculated for *Wood 4 feet in length.* If the wood be 8 feet long double the products; if 12 treble, and so on. If the wood should be only 3 feet in length, then deduct from the products ¼; if 3½ deduct 1-8. Fractions of a solid foot less than ½ are not counted; half foot and over is counted as 1 foot.

The Rule for Measuring Wood is, if in feet only, to multiply the length by the width, and that product by the height, and divide the last product, if for feet, by 16, and if for Cords by 128. But if any of the dimensions be in feet and inches, reduce the whole to inches and multiply as above, then divide the product by 1728 in order to obtain cubic feet, and then divide the quotient by 128 to obtain cords.

Hgt.		Width 2 ft and				Width 3 ft and				Width 4 ft and				Width 5 feet and				Width 6 feet and				Width 7 feet and				Width 8 feet and			
Ft.	In	0 in	3 in	6 in	9 in	0 in	3 in	6 in	9 in	0 in	3 in	6 in	9 in	0 in	3 in	6 in	9 in	0 in	3 in	6 in	9 in	0 in	3 in	6 in	9 in	0 in	3 in	6 in	9 in
1	0	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
1	2	9	11	12	13	14	15	16	18	19	20	21	22	23	25	26	27	28	29	30	32	33	34	35	36	37	39	40	41
1	4	11	12	13	15	16	17	19	20	21	23	24	25	27	28	29	31	32	33	35	36	37	39	40	41	43	44	45	47
1	6	12	14	15	17	18	20	21	23	24	26	27	29	30	32	33	35	36	38	39	41	42	44	45	47	48	50	51	53
1	8	13	15	17	18	20	22	23	25	27	29	30	32	33	35	37	38	40	42	43	45	47	48	50	52	53	55	57	58
1	10	15	17	18	20	22	24	26	28	29	31	33	35	37	39	40	42	44	46	48	50	51	53	55	57	59	61	62	64
2	0	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70
2	2	17	20	22	24	26	28	30	33	35	37	39	41	43	46	48	50	52	54	56	59	61	63	65	67	69	72	74	76
2	4	19	21	23	26	28	30	33	35	37	40	42	44	47	49	51	54	56	58	61	63	65	68	70	72	75	77	79	82
2	6	20	23	25	28	30	33	35	38	40	43	45	48	50	53	55	58	60	63	65	68	70	73	75	78	80	83	85	88
2	8	21	24	27	29	32	35	37	40	43	46	48	51	53	56	59	61	64	67	69	72	75	77	80	83	85	88	91	93
2	10	23	26	28	31	34	37	40	43	45	48	51	54	57	60	62	65	68	71	74	77	79	82	85	88	91	94	96	99
3	0	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72	75	78	81	84	87	90	93	96	99	102	105
3	2	25	29	32	35	38	41	44	48	51	54	57	60	63	67	70	73	76	79	82	86	89	92	95	98	101	105	108	111
3	4	27	30	33	37	40	43	47	50	53	57	60	63	67	70	73	77	80	83	87	90	93	97	100	103	107	110	113	117
3	6	28	32	35	39	42	46	49	53	56	60	63	67	70	74	77	81	84	88	91	95	98	102	105	109	112	116	119	123
3	8	29	33	37	40	44	48	51	55	59	63	66	70	73	77	81	84	88	92	95	99	103	106	110	114	117	121	125	128
3	10	31	35	38	42	46	50	54	58	61	65	69	73	77	81	84	88	92	96	100	104	107	111	115	119	123	127	130	134
4	0	32	36	40	44	48	52	56	60	64	68	72	76	80	84	88	92	96	100	104	108	112	116	120	124	128	132	136	140
4	2	33	38	42	46	50	54	58	63	67	71	75	79	83	88	92	96	100	104	108	113	117	121	125	129	133	138	142	146
4	4	35	39	43	48	52	56	61	65	69	74	78	82	87	91	95	100	104	108	113	117	121	126	130	134	139	143	147	152
4	6	36	41	45	50	54	59	63	68	72	77	81	86	90	95	99	104	108	113	117	122	126	131	135	140	144	149	153	158
4	8	37	42	47	51	56	61	65	70	75	80	84	89	93	98	103	107	112	117	121	126	131	135	140	145	149	154	159	163
4	10	39	44	48	53	58	63	68	73	77	82	87	92	97	102	106	111	116	121	126	131	135	140	145	150	155	160	164	169
5	0	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130	135	140	145	150	155	160	165	170	175

Example. How many cords of wood in a pile 60 feet long, 6 feet high and 4 feet wide?

$$\frac{60 \times 6 \times 4}{128} = \frac{1440}{128} = 11\tfrac{1}{4} \text{ cords.}$$

VALUE OF WOOD AND BARK PER FEET AND CORD.

The price per Cord is found at the top of the column. The Solid Feet are in the left hand column, (under Ft.) opposite which are the prices per foot. 128 cubic feet, or a Cord, or pile, 8 feet long 4 feet wide and 4 feet high, is a cord of wood as established by law in most of the States. If the price of more than one cord is required, the amounts can be readily added or multiplied.

	Ft.	2.00	2.25	2.50	3.00	3.25	3.50	4.00	4.25	4.50	5.00	5.25	5.50	6.00	6.25	6.50	7.00	7.25	7.50	8.00	8.50	9.00	9.50	10.00
	1	2	2	2	2	3	3	3	3	4	4	4	4	5	5	5	5	6	6	6	7	7	7	8
	2	3	4	4	5	5	5	6	7	7	8	8	9	9	10	10	11	11	12	13	13	14	14	16
	3	5	5	6	7	8	8	9	10	11	12	12	13	14	15	15	16	17	18	19	20	21	22	23
	4	6	7	8	9	10	11	13	13	14	16	16	17	19	20	20	22	23	23	25	27	28	30	31
	5	8	9	10	12	13	14	16	17	18	20	21	21	23	24	25	27	28	29	31	33	35	37	39
	6	9	11	12	14	15	16	19	20	21	23	25	26	28	29	30	33	34	35	38	40	42	45	47
	7	11	12	14	16	18	19	22	23	25	27	29	30	33	34	36	38	40	41	44	46	49	52	55
	8	13	14	16	19	20	22	25	27	28	31	33	34	38	39	41	44	45	47	50	53	26	59	63
	9	14	16	18	21	23	25	28	30	32	35	37	39	42	44	46	49	51	53	56	60	63	67	70
	10	16	17	20	24	25	27	31	33	35	39	41	43	47	49	51	55	57	59	63	66	70	74	78
1 Foot.	16	25	28	31	38	41	44	50	53	56	63	66	69	75	78	81	88	91	94	1 00	1 06	1 13	1 19	1 25
	20	31	35	39	47	51	55	63	67	70	78	82	86	94	98	1 02	1 09	1 13	1 17	1 25	1 33	1 41	1 48	1 56
	30	47	53	59	70	76	82	94	1 00	1 05	1 17	1 23	1 29	1 41	1 46	1 52	1 64	1 70	1 76	1 88	1 99	2 11	2 23	2 34
2 Feet.	32	50	56	63	75	81	88	1 00	1 06	1 13	1 25	1 31	1 38	1 50	1 56	1 63	1 75	1 81	1 88	2 00	2 13	2 25	2 38	2 50
	40	64	70	78	94	1 02	1 08	1 25	1 33	1 41	1 56	1 64	1 72	1 88	1 95	2 03	2 19	2 27	2 34	2 50	2 66	2 81	2 95	3 13
3 Feet.	48	75	84	94	1 13	1 22	1 31	1 50	1 60	1 69	1 88	1 97	2 06	2 25	2 35	2 44	2 63	2 72	2 81	3 00	3 19	3 38	3 56	3 75
	50	78	88	98	1 18	1 27	1 38	1 56	1 66	1 76	1 95	2 05	2 15	2 34	2 44	2 54	2 73	2 83	2 93	3 13	3 32	3 52	3 71	3 91
	60	94	1 05	1 17	1 40	1 52	1 64	1 88	1 99	2 11	2 34	2 46	2 58	2 81	2 93	3 05	3 28	3 40	3 52	3 75	3 98	4 22	4 45	4 69
4 Feet.	64	1 00	1 13	1 25	1 50	1 63	1 75	2 00	2 13	2 25	2 50	2 63	2 75	3 00	3 13	3 25	3 50	3 63	3 75	4 00	4 25	4 50	4 75	5 00
	70	1 09	1 23	1 37	1 64	1 78	1 91	2 19	2 32	2 46	2 73	2 87	3 01	3 28	3 42	3 55	3 83	3 96	4 10	4 38	4 65	4 93	5 19	5 47
5 Feet.	80	1 25	1 41	1 56	1 88	2 03	2 19	2 50	2 66	2 81	3 13	3 28	3 44	3 75	3 91	4 06	4 38	4 53	4 69	5 00	5 31	5 63	5 94	6 25
	90	1 41	1 58	1 76	2 12	2 29	2 46	2 81	2 99	3 16	3 51	3 69	3 87	4 22	4 39	4 57	4 92	5 10	5 27	5 63	5 98	6 33	6 67	7 03
6 Feet.	96	1 50	1 69	1 88	2 25	2 44	2 63	3 00	3 19	3 38	3 75	3 94	4 13	4 50	4 69	4 88	5 25	5 44	5 63	6 00	6 38	6 75	7 13	7 50
	100	1 56	1 76	1 95	2 36	2 54	2 73	3 13	3 32	3 52	3 91	4 10	4 30	4 69	4 88	5 08	5 47	5 66	5 86	6 25	6 64	7 03	7 41	7 82
7 Feet.	112	1 75	1 97	2 19	2 63	2 84	3 06	3 50	3 72	3 94	4 38	4 59	4 81	5 25	5 47	5 69	6 13	6 34	6 56	7 00	7 44	7 87	8 31	8 75
8 Feet.	128	2 00	2 25	2 50	3 00	3 25	3 50	4 00	4 25	4 50	5 00	5 25	5 50	6 00	6 25	6 50	7 00	7 25	7 50	8 00	8 50	9 00	9 50	10 00

WEIGHT OF A CORD OF WOOD.

Table of the Weight of a Cord of different kinds of Dry Wood, and the comparative amount of Charcoal, or real combustible matter, found in each.

A Cord of Hickory,	- - 4469	pounds,	Carbon - -	100	pounds.
" Maple,	- - - 2863	"	" - -	54	"
" White Birch,	- 2369	"	" - -	48	"
" " Beech,	- 3236	"	" - -	65	"
" " Ash,	- - 3450	"	" - -	77	"
" Pitch Pine,	- - 1904	"	" - -	43	"
" White Pine,	- 1868	"	" - -	42	"
" Lombardy Poplar	1774	"	" - -	40	"
" White Oak	- - 3821	"	" - -	81	"
" Yellow Oak,	- 2919	"	" - -	60	"
" Red Oak,	- - 3254	"	" - -	69	"

NOTE.—Nearly one half of the weight of a growing Oak tree consists of sap. Ordinary Dry Wood contains about one-fourth of its weight in water.

WEIGHT OF HARD COAL PROPORTIONED IN STOWAGE.

DESIGNATION.	Specific Gravity.*	Weight in pounds of cubic foot as sent to market.*	Cubic feet of space required to stow one ton of 2240 pounds.*	Cubic feet of space required to stow one ton of 2000 pounds.	Fixed Carbon in 100 parts.
Beaver Meadow,	1.610	54.925	40.780	36.41	88.942
Forest Improvement,	1.477	53.658	41.740	37.27	90.751
Peach Mountain,	1.464	53.794	41.640	37.20	89.020
Lehigh,	1.590	55.316	40.500	36 15	89.153
Lackawana,	1.421	48.886	45.820	40.91	87.741

* Walter Johnson's Report to the Navy Department of the U. States.

To obtain the Cubic feet of a COAL BIN, take the dimensions by measuring the inside—reduce the feet to inches, and multiply the length, breadth and depth together, and the product multiplied by .00058 gives the number of cubic feet.

NUMBER OF CUBIC INCHES IN VARIOUS BODIES.

[1728 cubic inches make 1 Cubic foot.]

A box 24 by 16 by 28 inches equal to 1 barrel, or 10,752 cubic inches.—Do. 24 by 16 by 14 inches equal ½ a barrel, or 5,376 cubic inches.—Do. 16 by 16 8-10 by 9 inches equal 1 bushel, or 2,150 4-10 cubic inches.—Do. 12 by 11 2-10 by 8 inches equal ¼ a bushel, or 1,075 2-10 cubic inches.—Do. 8 by 8 4-10 by 8 inches equal ½ 1 peck, or 537 6-10 cubic inches.—Do. 8 by 8 by 4 2-10 inches equal ½ a peck, or 268 8-10 cubic inches.—Do 7 by 4 by 4 8-10 inches equal ¼ a gallon, or 134 4-10 cubic inches.—Do. 4 by 4 by 4 2-10 inches equal 1 quart, or 67 2-10 cubic inches.

READY RECKONER. MONTH WAGES TABLE FOR MECHANICS AND FARMERS.

[*Wages per Month, from $5·00 to $30·00*]

The Mechanics' and Farmers' Month Table will be found particularly serviceable in casting up Days' Work by the Month, allowing 26 working days for a month, from $5 to $30, or any larger sum. If a person has engaged for $27 a month, and works but 13 days, the figures under $17 and $10 can be added together, as follows:—13 days at $10 amounts to $5, and the same at $17 amounts to $8·50,—if both are added together, we have $13·50 for 13 days, which is at the rate of $27 per month, and so with any other amount.

Days.	$5 00	$6 00	$7 00	$8 00	$9 00	$10 00	$11 00	$12 00	$13 00	$14 00	$15 00	$16 00	$17 00	$18 00	$19 00	$20 00	$25 00	$30 00
1	19	23	27	31	35	39	42	46	50	54	58	62	66	69	73	77	96	1 16
2	39	46	54	62	69	77	85	92	1 00	1 08	1 16	1 23	1 31	1 39	1 46	1 54	1 92	2 31
3	58	69	81	92	1 04	1 16	1 27	1 39	1 50	1 62	1 73	1 85	1 96	2 08	2 19	2 31	2 89	3 46
4	77	93	1 08	1 23	1 39	1 54	1 69	1 85	2 00	2 16	2 31	2 46	2 62	2 77	2 92	3 08	3 85	4 62
5	96	1 15	1 35	1 54	1 73	1 92	2 12	2 31	2 50	2 69	2 89	3 08	3 27	3 46	3 65	3 85	4 81	5 77
6	1 16	1 38	1 62	1 85	2 08	2 31	2 54	2 77	3 00	3 23	3 46	3 69	3 92	4 16	4 38	4 62	5 77	6 92
7	1 35	1 62	1 89	2 16	2 42	2 69	2 96	3 23	3 50	3 77	4 04	4 31	4 58	4 85	5 12	5 39	6 73	8 08
8	1 54	1 85	2 16	2 46	2 77	3 08	3 39	3 69	4 00	4 31	4 62	4 92	5 23	5 54	5 85	6 16	7 69	9 23
9	1 73	2 08	2 43	2 77	3 12	3 46	3 81	4 16	4 50	4 85	5 19	5 54	5 89	6 23	6 58	6 93	8 66	10 38
10	1 92	2 31	2 69	3 08	3 46	3 85	4 23	4 62	5 00	5 39	5 77	6 15	6 54	6 92	7 31	7 69	9 62	11 54
11	2 12	2 54	2 96	3 39	3 81	4 23	4 65	5 08	5 50	5 92	6 35	6 77	7 19	7 62	8 04	8 46	10 58	12 69
12	2 31	2 76	3 23	3 69	4 16	4 62	5 08	5 54	6 00	6 46	6 92	7 39	7 85	8 31	8 77	9 23	11 54	13 85
13	2 50	3 00	3 50	4 00	4 50	5 00	5 50	6 00	6 50	7 00	7 50	8 00	8 50	9 00	9 50	10 00	12 50	15 00
14	2 69	3 23	3 77	4 31	4 85	5 39	5 92	6 46	7 00	7 54	8 08	8 62	9 16	9 69	10 23	10 77	13 46	16 16
15	2 89	3 46	4 04	4 62	5 19	5 77	6 35	6 92	7 50	8 08	8 66	9 23	9 81	10 39	10 96	11 54	14 43	17 31
16	3 08	3 69	4 31	4 92	5 54	6 15	6 77	7 39	8 00	8 62	9 23	9 85	10 46	11 08	11 69	12 31	15 39	18 46
17	3 27	3 92	4 58	5 23	5 89	6 54	7 19	7 85	8 50	9 16	9 81	10 46	11 12	11 77	12 42	13 08	16 35	19 62
18	3 46	4 16	4 85	5 54	6 23	6 92	7 62	8 31	9 00	9 69	10 39	11 08	11 77	12 46	13 15	13 85	17 31	20 77
19	3 66	4 39	5 12	5 85	6 58	7 31	8 04	8 77	9 50	10 23	10 96	11 69	12 42	13 16	13 89	14 62	18 27	21 92
20	3 85	4 62	5 39	6 16	6 92	7 69	8 46	9 23	10 00	10 77	11 54	12 31	13 08	13 85	14 62	15 39	19 23	23 08
21	4 04	4 85	5 66	6 46	7 27	8 08	8 89	9 69	10 50	11 31	12 12	12 92	13 73	14 54	15 35	16 16	20 19	24 23
22	4 23	5 08	5 92	6 77	7 62	8 46	9 31	10 16	11 00	11 85	12 69	13 54	14 39	15 23	16 08	16 92	21 15	25 38
23	4 43	5 31	6 19	7 08	7 96	8 85	9 73	10 62	11 50	12 39	13 27	14 15	15 04	15 92	16 81	17 69	22 12	26 54
24	4 62	5 54	6 46	7 39	8 31	9 23	10 16	11 08	12 00	12 92	13 85	14 77	15 69	16 62	17 54	18 46	23 08	27 69
25	4 81	5 77	6 73	7 69	8 66	9 62	10 58	11 54	12 50	13 46	14 42	15 39	16 35	17 31	18 27	19 23	24 04	28 85
26	5 00	6 00	7 00	8 00	9 00	10 00	11 00	12 00	13 00	14 00	15 00	16 00	17 00	18 00	19 00	20 00	25 00	30 00

[*Wages per Week, from 50 Cents to 3·25.*]

WAGES, PER WEEK, FROM 50 CENTS, to $3·25. FOR MANUFACTURERS & MECHANICS.

Days.	50 *cts.*	60 *cts.*	62½ *ct.*	70 *cts.*	75 *cts.*	80 *cts.*	87½ *ct.*	90 *cts*	$1·00	$1·12½	$1·25
¼	·2	·2½	·2½	·3	·3	·3½	·3½	·3½	·4	·4½	·5½
½	·4	·5	·5½	·5½	·6½	·6½	·7½	·7½	·8½	·9½	·10½
¾	·6½	·7½	·7½	·8½	·9½	·9½	·10½	·11½	·12½	·14	·15½
1	·8½	·10	·10½	·11½	·12½	·13½	·14½	·15	·16½	·18½	·20½
2	·16½	·20	·20½	·23½	·25	·26½	·29	·30	·33½	·37½	·41½
3	·25	·30	31½	·35	·37½	·40	·43½	·45	·50	·56½	·62½
4	·33½	·40	·41½	·46½	·50	·53½	·58½	·60	·66½	·75	·83½
5	·41½	·50	·52	·58½	·62½	·66½	·73	·75	·83½	·93½	1·04
6	·50	·60	·62½	·70	·75	·80	87½	·90	1·00	1·12½	1·25
7	·58½	·70	·73	·81½	·87½	·93½	1·02	1·05	1.16½	1·31½	1·45½
8	·66½	·80	·83½	·93½	1·00	1·06½	1·16½	1·20	1.33½	1·50	1·66½
9	·75	·90	.93¾	1·05	1·12½	1·20	1·31½	1·35	1·50	1·68¾	1·87½
10	·83½	1·00	1·04	1·16½	1·25	1·33½	1·45½	1·50	1·66½	1·87½	2·08½
11	·91½	1·10	1·14½	1·28½	1·37½	1·46½	1·60½	1·65	1·83½	2·06¾	2·29
12	1·00	1·20	1·25	1·40	1·50	1·60	1·75	1.80	2·00	2·25	2·50
13	1·08½	1·30	1·35½	1·51½	1·62½	1.73½	1·89½	1·95	2 16½	2·43¾	2·70¾
14	1·16½	1 40	1·45¾	1·63¼	1·75	1·86½	2·04	2·10	2 33½	2·62½	2·91¼
15	1·25	1·50	1·56	1 75	1·87½	2·00	2·18¾	2 25	2·50	2·81¼	3·12½
16	1·33½	1·60	1·66½	1·86½	2·00	2·12½	2 33½	2·40	2 66½	3·00	3·33½
17	1·41½	1·70	1·77	1·98½	2·12½	2·26½	2·48	2 55	2·83½	3·18¾	3·54
18	1·50	1·80	1.87½	2·10	2·25	2·40	2·62½	2·70	3·00	3·37½	3·75
19	1·58½	1 90	1.97½	2·21½	2·37½	2·53½	2·77	2·85	3·16½	3·56¼	3·95¾
20	1·66½	2 00	2·08½	2·33½	2·50	2·66½	2·91½	3·00	3·33½	3·75	4·16½
21	1·75	2·10	2·18½	2·45	2·62½	2·80	3·06½	3·15	3·50	3·93¾	4·37½
22	1·83½	2·20	2 29	2·56½	2·75	2·93½	3·20½	3·30	3·66½	4·12½	4·58½
23	1·91½	2·30	2·39½	2 68½	2·87½	3·06½	3·35½	3·45	3·83½	4·31¼	4·79
24	2·00	2·40	2·50	2·80	3·00	3·20	3·50	3·60	4·00	4·50	5·00
25	2 08½	2·50	2 60½	2·91½	3·12½	3·33½	3·64½	3·75	4·16½	4·68¾	5·20¼
26	2·16½	2.60	2·70½	3·03½	3·25	3·46½	3·79	3·90	4·33½	4·87½	5·42
27	2·25	2·70	2·81	3·15	3·37½	3·60	3·93½	4·05	4·50	5·06¼	5·62½
28	2·33½	2·80	2 91½	3·26½	3·50	3·73½	4·08½	4·20	4·66½	5·25	5·83½

Days.	$1·37½	$1·50	$1·62½	$1·75	$1·87½	$2·00	$2·25	$2·50	$2·75	$3·00	$3·25
¼	·5	·6¼	·6¾	·7¼	·7¾	·8¼	·9¼	·10½	·11½	·12½	·13¼
½	·11½	.12½	·13½	·14½	·15½	·16½	·18½	·20½	·23	·25	·27
¾	·17½	·18½	·20½	·21½	·23½	·25	·28	·31½	·34½	·37½	·40½
1	·23	25	·27	·29	·31½	·33½	·37½	·41½	·45½	·50	·54
2	·46	·50	·54	·58½	·62½	·66½	·75	·83½	·91½	1·00	1·08½
3	·68½	·75	·81½	·87½	·93½	1·00	1·12½	1·25	1·37½	1·50	1·62½
4	·91½	1·00	1·08½	1·16½	1·25	1·33½	1·50	1·66½	1·83½	2·00	2·16½
5	1·14½	1·25	1·35½	1·45½	1·56½	1·66½	1·87½	2·08½	2·29	2·50	2·70½
6	1·37½	1·50	1·62½	1·75	1·87½	2·00	2·25	2·50	2·75	3·00	3·25
7	1·60½	1·75	1·89½	2·04	2·18¾	2·33½	2·62½	2·91½	3·20¾	3·50	3·79
8	1·83½	2·00	2·16½	2·33½	2·50	2·66½	3·00	3·33½	3·66½	4·00	4·33½
9	2·06½	2·25	2·43¾	2·62½	2·81¼	3·00	3·37½	3·75	4·12½	4·50	4·87½
10	2·29	2·50	2·70½	2·91½	3·12½	3·33½	3·75	4·16½	4·58½	5·00	5·41½
11	2·52	2·75	2·98	3·20½	3·43¾	3·66½	4·12½	4·58½	5·04	5·50	5·95½
12	2·75	3·00	3·25	3·50	3·75	4·00	4·50	5·00	5·50	6·00	6·50
13	2·98	3·25	3·52	3·79	4·06¼	4·33½	4·87½	5·41½	5·95¾	6·50	7·04
14	3.21	3·50	3·79	4·08¼	4·37½	4·66½	5·25	5·83½	6·41¼	7·00	7·58½
15	3·43¾	3·75	4·06¼	4·37½	4·68¾	5·00	5·62½	6·25	6·87½	7·50	8·12½
16	3·66½	4·00	4·33½	4·66½	5·00	5·33½	6·00	6·66½	7·33½	8·00	8·66½
17	3·89½	4·25	4·60½	4·95½	5·31¼	5·66½	6·37½	7·08½	7·79	8·50	9·20½
18	4·12½	4·50	4·87½	5·25	5·62½	6·00	6·75	7·50	8·25	9·00	9·75
19	4·35½	4·75	5·14½	5·54	5·93¾	6·33½	7·12½	7·91½	8·70¾	9.50	10·29
20	4.58½	5·00	5·41½	5·83½	6·25	6·66½	7·50	8·33½	9·16½	10·00	10·83½
21	4·81½	5·25	5·68¾	6·12½	6·56¼	7·00	7·87½	8·75	9·62½	10·50	11·37½
22	5·04	5·50	5·95½	6·41½	6·87½	7·33½	8·25	9·16½	10·08¼	11·00	11·91½
23	5·27	5·75	6·22½	6·70¾	7·18¾	7 66½	8·62½	9·58½	10·54	11·50	12·45¾
24	5·50	6·00	6·50	7·00	7·50	8·00	9·00	10·00	11·00	12 00	13·00
25	5·73	6·25	6·77	7·29	7·81¼	8·33½	9·37½	10·41¼	11·45¾	12·50	13·54
26	5·96	6·50	7·04	7·58½	8·12½	8·66½	9·75	10·83½	11·91½	13·00	14·08½
27	6·18¾	6·75	7·31¼	7·87½	8·43¾	9·00	10·12½	11·25	12·37½	13·50	14·62½
28	6·41½	7·00	7·58½	8·16½	8·75	9·33½	10·50	11·66½	12.83½	14·00	15·16½

[*Wages per Week, from* £3·50 *to* £12·00.]

WAGES, PER WEEK, FROM £3·50 to £12·00. FOR MANUFACTURERS & MECHANICS.

Days.	£3·50	£3·75	£4·00	£4·25	£4·50	£4·75	£5·00	£5·25	£5·50	£5·75	£6·00
¼	·14½	·15½	·16½	·17¾	·18¾	·19¾	·20¾	·21¾	·23	·24	·25
½	·29	·31¼	·33½	·35½	·37½	·39½	·41½	·43½	·45¾	·48	·50
¾	·43½	·46¾	·50	·53	·56¼	·59¼	·62½	·65½	·68¾	·71¾	·75
1	·58½	·62½	·66½	·70¾	·75	·79	·83½	·87½	·91½	·95¾	1·00
2	1·16½	1·25	1·33½	1·41½	1·50	1·58½	1·66½	1·75	1·83½	1·91½	2·00
3	1·75	1 87½	2.00	2·12½	2·25	2·37½	2·50	2·62½	2·75	2·87½	3·00
4	2·33½	2·50	2·66½	2·83½	3·00	3·16½	3·33½	3·50	3·66½	3·83½	4·00
5	2·91½	3·12½	3·33½	3·54½	3·75	3·95½	4·16½	4·37½	4·58½	4·79	5·00
6	3·50	3·75	4·00	4·25	4·50	4·75	5·00	5·25	5·50	5·75	6·00
7	4·08½	4·37½	4·66½	4·95½	5·25	5·54	5·83½	6·12½	6·41½	6·70½	7·00
8	4·66½	5·00	5·33½	5·66½	6·00	6·33½	6·66½	7·00	7·33½	7·66½	8·00
9	5·25	5·62½	6·00	6·37½	6·75	7·12½	7·50	7·87½	8·25	8·62½	9·00
10	5·83½	6·25	6·66½	7·08½	7·50	7·91½	8·33½	8·75	9·16½	9·58½	10·00
11	6·41½	6·87½	7·33½	7·79	8·25	8·70½	9·16½	9·62½	10·08½	10·54	11·00
12	7·00	7·50	8.00	8·50	9·00	9·50	10·00	10·50	11·00	11·50	12·00
13	7·58½	8·12½	8·66½	9·20½	9·75	10·29	10·83½	11·37½	11·91½	12·45½	13·00
14	8·16½	8·75	9·33½	9·91½	10·50	11·08½	11·66½	12·25	12·83½	13·41½	14·00
15	8·75	9·37½	10·00	10·62½	11·25	11·87½	12·50	13·12½	13·75	14·37½	15·00
16	9·33½	10·00	10·66½	11·33½	12·00	12·66½	13·33½	14·00	14·66½	15·33½	16·00
17	9·91½	10·62½	11·33½	12·04	12·75	13·45½	14·16½	14·87½	15·58½	16·29	17·00
18	10·50	11·25	12·00	12·75	13·50	14·25	15·00	15·75	16·50	17·25	18·00
19	11·08½	11·87½	12·66½	13·45½	14·25	15·04	15·83½	16·62½	17·41½	18·20½	19·00
20	11·66½	12·50	13·33½	14·16½	15·00	15·83½	16·66½	17·50	18.33½	19·16½	20·00
21	12·25	13·12½	14·00	14·87½	15·75	16·62½	17·50	18·37½	19·25	20·12½	21·00
22	12·83½	13·75	14·66½	15·58½	16·50	17·41½	18·33½	19·25	20·16½	21·08½	22·00
23	13·41½	14·37½	15·33½	16·29	17·25	18·20½	19·16½	20·12½	21·08½	22·04	23·00
24	14·00	15·00	16·00	17·00	18·00	19·00	20·00	21·00	22·00	23·00	24·00
25	14·58½	15·62½	16·66½	17·70½	18·75	19·79	20·83½	21·87½	22·91½	23·95½	25·00
26	15·16½	16·25	17·33½	18·41½	19·50	20·58½	21·66½	22·75	23·83½	24·91½	26·00
27	15·75	16·87½	18·00	19·12½	20·25	21·37½	22·50	23·62½	24·75	25·87½	27·00
28	16·33½	17·50	18·66½	19·83½	21·00	22·16½	23·33½	24·50	25.66½	26·83½	28·00

Days.	£6·50	£7·00	£7·50	£8·00	£8·50	£9·00	£9·50	£10·00	£10·50	£11·00	£12·00
¼	·27	·29	·31½	·33½	·35½	·37½	·39½	·41½	·43¾	·45¾	·50
½	·54	·58¼	·62½	·66½	·70¾	·75	·79	·83¼	·87½	·91½	1·00
¾	·81½	·87½	·93¾	1·00	1·06¼	1·12½	1·18¾	1·25	1·31¼	1·37½	1·50
1	1·08½	1·16½	1·25	1·33½	1·41½	1·50	1·58½	1·66½	1·75	1·83½	2·00
2	2·16½	2·33¼	2·50	2·66½	2·83¼	3·00	3·16½	3·33¼	3·50	3·66½	4 00
3	3·25	3·50	3·75	4·00	4·25	4·50	4·75	5·00	5·25	5·50	6·00
4	4·33½	4·66½	5·00	5·33½	5·66½	6·00	6·33½	6 66½	7·00	7·33½	8·00
5	5·41½	5·83½	6·25	6·66½	7·08½	7·50	7·91½	8·33½	8·75	9·16½	10·00
6	6·50	7·00	7·50	8·00	8·50	9·00	9·50	10·00	10·50	11·00	12·00
7	7·58½	8·16½	8·75	9·33½	9·91½	10·50	11·08½	11·66½	12·25	12·83½	14·00
8	8·66½	9·33½	10·00	10·66½	11·33½	12·00	12·66½	13·33¼	14·00	14·66½	16·00
9	9·75	10·50	11·25	12·00	12·75	13·50	14·25	15·00	15·75	16·50	18·00
10	10·83½	11·66½	12·50	13·33½	14·16½	15·00	15·83½	16·66½	17·50	18·33½	20·00
11	11·91½	12·83½	13·75	14·66½	15·58½	16.50	17·41½	18·33¼	19·25	20·16½	22·00
12	13·00	14·00	15·00	16·00	17·00	18·00	19·00	20·00	21·00	22·00	24·00
13	14·08½	15·16½	16·25	17·33½	18·41½	19·50	20·58½	21·66½	22·75	23·83¼	26·00
14	15·16½	16·33½	17·50	18·66½	19·83½	21·00	22·16½	23·33½	24·50	25·66½	28·00
15	16·25	17·50	18·75	20·00	21·25	22·50	23·75	25·00	26·25	27·50	30·00
16	17·33½	18 66½	20·00	21·33½	22·66¼	24·00	25·33½	26·66½	28·00	29·33½	32·00
17	18·41½	19·83¼	21·25	22·66½	24·08¼	25·50	26·91¼	28·33½	29·75	31·16½	34·00
18	19·50	21·00	22·50	24·00	25·50	27·00	28·50	30·00	31·50	33·00	36·00
19	20·58½	22·16½	23·75	25·33½	26·91½	28·50	30·08¼	31·66½	33·25	34·83½	38·00
20	21·66½	23·33½	25·00	26·66½	28·33½	30·00	31·66¼	33·33½	35·00	36·66½	40·00
21	22·75	24·50	26·25	28·00	29·75	31·50	33·25	35·00	36·75	38·50	42·00
22	23·83½	25·66½	27·50	29·33½	31 16½	33·00	34·83½	36·66½	38·50	40·33½	44·00
23	24·91½	26·83¼	28·75	30·66½	32·58¾	34·50	36·41½	38·33½	40·25	42·16½	46·00
24	26·00	28·00	30·00	32·00	34·00	36·00	38·00	40·00	42·00	44·00	48·00
25	27·08½	29·16½	31·25	33·33½	35·41½	37·50	39·58½	41·66½	43·75	45·83½	50·00
26	28·16½	30·33¼	32·50	34·66½	36·83¼	39·00	41·16¼	43·33½	45·50	47·66½	52·00
27	29·25	31·50	33·75	36·00	38·25	40·50	42·75	45·00	47·25	49·50	54·00
28	30·33½	32·66¼	35·00	37·33½	39·66½	42·00	44·33½	46·66½	49·00	51·33½	56·00

TABLE FOR CALCULATING SEAMEN'S & BOATMEN'S WAGES, FROM 5 TO 17 DOLLARS PER MONTH.

No. of Days.	SEAMEN'S WAGES BY THE DAY AND MONTH.												
	mo. $ 5·00	mo. $ 6·00	mo. $ 7·00	mo. $ 8·00	mo. $ 9·00	mo. $ 10·00	mo. $ 11·00	mo. $ 12·00	mo. $ 13·00	mo. $ 14.00	mo. $ 15·00	mo, $ 16·00	mo. $ 17 00
1	0·17	0·20	0·23	0·27	0·30	0 33	0·37	0·40	0·43	0·47	0·50	0·53	0·57
2	0·33	0·40	0·47	0·53	0·60	0·67	0·73	0·80	0·87	0·93	1·00	1·07	1·13
3	0·50	0·60	0·70	0·80	0·90	1·00	1·10	1·20	1·30	1·40	1·50	1·60	1·70
4	0·67	0·80	0·93	1·07	1·20	1·33	1·47	1·60	1·73	1·87	2·00	2·13	2·27
5	0·83	1·00	1·17	1·33	1·50	1·67	1·83	2·00	2·17	2·33	2·50	2·67	2·83
6	1·00	1·20	1·40	1·60	1·80	2·00	2·20	2·40	2·60	2·80	3·00	3·20	3·40
7	1·17	1·40	1·63	1·87	2·10	2 33	2·57	2·80	3·03	3·27	3·50	3·73	3·97
8	1·33	1·60	1·87	2·13	2·40	2·67	2·93	3·20	3·47	3·73	4·00	4·27	4·53
9	1·50	1·80	2·10	2·40	2·70	3·00	3·30	3·60	3·90	4·20	4·50	4 80	5·10
10	1·67	2·00	2·33	2·67	3·00	3·33	3·67	4·00	4·33	4·67	5·00	5·33	5·67
11	1 83	2·20	2·57	2·93	3 30	3·67	4.03	4·40	4·77	5·13	5·50	5·87	6·23
12	2·00	2·40	2·80	3·20	3·60	4·00	4·40	4·80	5·20	5·60	6·00	6·40	6·80
13	2·17	2·60	3·03	3·47	3·90	4·33	4·77	5·20	5·63	6·07	6·50	6·93	7·37
14	2·33	2·80	3·27	3·73	4·20	4·67	5·13	5·60	6·07	6·53	7·00	7·47	7·93
15	2·50	3·00	3·50	4·00	4·50	5·00	5·50	6·00	6 50	7·00	7·50	8·00	8·50
16	2·67	3·20	3·73	4·27	4 80	5·33	5·87	6·40	6·93	7·47	8·00	8·53	9·07
17	2·83	3·40	3·97	4·53	5·10	5·67	6·23	6·80	7·37	7·93	8 50	9·07	9·63
18	3.00	3·60	4·20	4·80	5·40	6·00	6·60	7·20	7·80	8·40	9 00	9·60	10·20
19	3·17	3·80	4·43	5·07	5·70	6·33	6·97	7·60	8·23	8·87	9·50	10·13	10·77
20	3 33	4·00	4·67	5·33	6·00	6·67	7·33	8·00	8·67	9·33	10·00	10·67	11·33
21	3·50	4·20	4·90	5·60	6·30	7·00	7·70	8·40	9·10	9·80	10·50	11·20	11·90
22	3·67	4·40	5·13	5·87	6·60	7·33	8·07	8·80	9·53	10·27	11·00	11·73	12·47
23	3·83	4·60	5·37	6·13	6·90	7·67	8·43	9·20	9·97	10·73	11·50	12·27	13·03
24	4·00	4·80	5·60	6·40	7·20	8·00	8·80	9·60	10 40	11·20	12·00	12·80	13 60
25	4·17	5·00	5·83	6·67	7·50	8·33	9·17	10·00	10·83	11 67	12·50	13·33	14·17
26	4·33	5·20	6·07	6·93	7·80	8·67	9·53	10 40	11·27	12·13	13·00	13·87	14·73
27	4·50	5·40	6 30	7·20	8·10	9·00	9·90	10·80	11·70	12·60	13·50	14·40	15·30
28	4·67	5·60	6·53	7·47	8·40	9·33	10·27	11·20	12·13	13·07	14·00	14·93	15·87
29	4·83	5·80	6·77	7·73	8·70	9·67	10·63	11·60	12·57	13 53	14·50	15·47	16·43
30	5·00	6·00	7 00	8·00	9·00	10·00	11·00	12·00	13·00	14·00	15 00	16·00	17·00
½	0·04	0 05	0·06	0·07	0·08	0·08	0·09	0·10	0·11	0·12	0·13	0·13	0·14
¼	0 08	0·10	0·12	0·13	0·15	0·17	0·18	0·20	0·22	0·23	0·25	0·27	0·28
¼	0·12	0·15	0·17	0.20	0·23	0·25	0·27	0·30	0·32	0·35	0·38	0·40	0·42

N. B. It is the practice in business, in casting accounts, whenever there is a half cent, to take one cent; for a fraction less than half cent, nothing is taken.

Seamen are entitled to demand and receive from the master, one third part of the wages which shall be due them, at every port where the vessel unlades and delivers her cargo before the voyage is ended; unless the contrary is stipulated in the Shipping Articles.

SEAMEN'S AND BOATMEN'S WAGES, — CONTINUED.

No. of Days.	SEAMEN'S WAGES BY THE DAY AND MONTH.												
	mo. $ 18·00	mo. $ 19·00	mo. $ 20·00	mo. $ 21·00	mo. $ 22·00	mo. $ 23 00	mo. $ 24·00	mo. $ 25·00	mo. $ 26·00	mo. $ 27·00	mo. $ 28·00	mo. $ 29·00	mo. $ 30·00
1	0·60	0·63	0·67	0·70	0·73	0·77	0·80	0·83	0·87	0·90	0·93	0·97	1·00
2	1·20	1·27	1·33	1·40	1·47	1·53	1·60	1·67	1·73	1·80	1·87	1·93	2·00
3	1·80	1·90	2·00	2·10	2·20	2·30	2·40	2·50	2.60	2·70	2·80	2·90	3·00
4	2·40	2·53	2·67	2·80	2·93	3·07	3·20	3·33	3·47	3·60	3·73	3·87	4·00
5	3·00	3·17	3·33	3·50	3·67	3·83	4·00	4·17	4·33	4·50	4·67	4·83	5·00
6	3·60	3·80	4·00	4·20	4·40	4·60	4·80	5·00	5·20	5·40	5·60	5·80	6·00
7	4·20	4·43	4 67	4·90	5 13	5·37	5·60	5·83	6·07	6·30	6·53	6·77	7·00
8	4·80	5·07	5·33	5·60	5·87	6·13	6·40	6·67	6·93	7·20	7·47	7·73	8·00
9	5·40	5·70	6·00	6·30	6·60	6·90	7·20	7·50	7·80	8·10	8·40	8·70	9·00
10	6·00	6·33	6·67	7·00	7·33	7·67	8·00	8·33	8·67	9·00	9·33	9·67	10·00
11	6·60	6·97	7·33	7·70	8·07	8·43	8·80	9·17	9·53	9·90	10 27	10 63	11·00
12	7·20	7·60	8·00	8·40	8·80	9·20	9·60	10·00	10·40	10·80	11·20	11·60	12·00
13	7·80	8·23	8·67	9·10	9·53	9·97	10·40	10·83	11·27	11·70	12·13	12·57	13·00
14	8·40	8·87	9·33	9·80	10·27	10 73	11·20	11·67	12·13	12·60	13·07	13·53	14·00
15	9·00	9·50	10·00	10·50	11·00	11·50	12·00	12·50	13·00	13·50	14·00	14·50	15·00
16	9·60	10·13	10·67	11·20	11 73	12·27	12·80	13·33	13·87	14·40	14·93	15·47	16·00
17	10·20	10·77	11·33	11·90	12·47	13·03	13·60	14·17	14·73	15·30	15·87	16·43	17 00
18	10·80	11·40	12·00	12·60	13·20	13·80	14·40	15·00	15 60	16 20	16·80	17·40	18·00
19	11·40	12·03	12·67	13·30	13·93	14·57	15·20	15·83	16·47	17·10	17·73	18·37	19·00
20	12·00	12·67	13.33	14·00	14·67	15·33	16·00	16·67	17·33	18·00	18·67	19·33	20·00
21	12·60	13·30	14·00	14·70	15·40	16·10	16·80	17·50	18·20	18·90	19 60	20,30	21·00
22	13·20	13·93	14·67	15·40	16·13	16·87	17·60	18 33	19·07	19·80	20 53	21·27	22·00
23	13·80	14·57	15·33	16·10	16·87	17·63	18·40	19·17	19·93	20·70	21·47	22·23	23·00
24	14·40	15·20	16·00	16·80	17·60	18·40	19·20	20·00	20·80	21·60	22 40	23·20	24·00
25	15 00	15·83	16·67	17·50	18·33	19·17	20·00	20·83	21·67	22·50	23·33	24 17	25·00
26	15·60	16·47	17·33	18·20	19·07	19·93	20·80	21·67	22·53	23·40	24·27	25·13	26·00
27	16·20	17·10	18·00	18·90	19·80	20·70	21·60	22·50	23·40	24·30	25·20	26·10	27·00
28	16·80	17·73	18·67	19·60	20·53	21·47	22·40	23·33	24·27	25·20	26·13	27·07	28·00
29	17·40	18·37	19 33	20 30	21·27	22·23	23·20	24·17	25·13	26·10	27·07	28·03	29·00
30	18·00	19·00	20·00	21·00	22·00	23·00	24·00	25·00	26·00	27·00	28·00	29·00	30·00
¼	0 15	0·16	0·17	0·18	0·18	0·19	0·20	0·21	0 22	0·23	0.23	0 24	0·25
½	0·30	0·32	0 33	0·35	0·37	0·38	0·40	0 42	0·43	0·45	0·47	0·48	0·50
¾	0·45	0·47	0·50	0·53	0·55	0·57	0·60	0·62	0·65	0·68	0·70	0 72	0 75

If a Seaman's Wages are not paid within ten days after the voyage is ended, he may libel the vessel. But if he is bound to remain and assist in discharging the cargo, then he cannot attach the vessel until ten days after the cargo is discharged, unless she is going to sail before that time. If the sailor is discharged at the end of the voyage, and before the cargo is unloaded, then he may proceed immediately against the vessel.

AN ALMANAC FOR THIRTY YEARS.

SHOWING THE DAY OF THE WEEK AND MONTH IN ANY YEAR FROM 1851 TO 1880.

Example.—To ascertain the day of the week corresponding to December 25, 1855, look in the Table of Years for 1855, opposite which will be found the letter G, (termed the Dominical letter); then look in the Table of Months, opposite December, for the same letter (G), and underneath the column containing it will be found the Calendar for December 1855, which shows December 25 to be Tuesday. When the Calendar for the Month is found, any other Day of the Week or Month can easily be ascertained.

A note is made payable at six months from June 4th, 1855, on what month and day of the month will it fall due? Answer—Friday, December 7, grace included.

It will be observed that there are two letters opposite the Leap Years. The first letter is used for January and February, the second for the other Months.

Months.													
January,....	A.		B.		C.		D.		E.		F.		G.
February,...	D		E.		F.		G.		A.		B.		C.
March,.....	D.		E.		F.		G.		A.		B		C.
April, ...	G.		A.		B.		C.		D.		E.		F.
May,.....	B.		C.		D.		E.		F.		G.		A.
June,.....	E.		F.		G.		A.		B.		C.		D.
July, ...	G.		A.		B.		C.		D.		E.		F.
August,.....	C.		D.		E.		F.		G.		A		B.
September,..	F.		G.		A.		B.		C.		D.		E.
October.....	A.		B.		C.		D.		E.		F.		G.
November,..	D.		E.		F.		G.		A.		B.		C.
December,..	F.		G.		A.		B.		C.		D.		E.
Years.	1	S.	1	Sa.	1	Fr.	1	Th.	1	W.	1	Tu.	1	M.
1851 E.	2	M.	2	S.	2	Sa.	2	Fr.	2	Th.	2	W.	2	Tu.
1852 D. C.	3	Tu.	3	M.	3	S.	3	Sa.	3	Fr.	3	Th.	3	W.
1853 B.	4	W.	4	Tu.	4	M.	4	S.	4	Sa.	4	Fr.	4	Th.
1854 A.	5	Th.	5	W.	5	Tu.	5	M.	5	S.	5	Sa.	5	Fr.
1855 G.	6	Fr.	6	Th.	6	W.	6	Tu.	6	M.	6	S.	6	Sa.
1856 F. E.	7	Sa.	7	Fr.	7	Th.	7	W.	7	Tu.	7	M.	7	S.
1857 D.	8	S.	8	Sa.	8	Fr.	8	Th.	8	W.	8	Tu.	8	M.
1858 C.	9	M.	9	S.	9	Sa.	9	Fr.	9	Th.	9	W.	9	Tu.
1859 B.	10	Tu.	10	M.	10	S.	10	Sa.	10	Fr.	10	Th.	10	W.
1860 A. G.	11	W.	11	Tu.	11	M.	11	S.	11	Sa.	11	Fr.	11	Th.
1861 F.	12	Th.	12	W.	12	Tu.	12	M.	12	S.	12	Sa.	12	Fr.
1862 E.	13	Fr.	13	Th.	13	W.	13	Tu.	13	M.	13	S.	13	Sa.
1863 D.	14	Sa	14	Fr.	14	Th.	14	W.	14	Tu.	14	M.	14	S.
1864 C. B.	15	S.	15	Sa.	15	Fr.	15	Th.	15	W.	15	Tu.	15	M.
1865 A.	16	M.	16	S.	16	Sa.	16	Fr.	16	Th.	16	W.	16	Tu.
1866 G.	17	Tu.	17	M.	17	S.	16	Sa.	17	Fr.	17	Th.	17	W.
1867 F.	18	W.	18	Tu.	18	M.	18	S.	18	Sa.	18	Fr.	18	Th.
1868 E. D.	19	Th.	19	W.	19	Tu.	19	M.	19	S.	19	Sa.	19	Fr.
1869 C.	20	Fr.	20	Th.	20	W.	20	Tu.	20	M.	20	S.	20	Sa.
1870 B.	21	Sa.	21	Fr.	21	Th.	21	W.	21	Tu	21	M.	21	S.
1871 A.	22	S.	22	Sa.	22	Fr.	22	Th.	22	W.	22	Tu.	22	M.
1872 G. F.	23	M.	23	S.	23	Sa.	23	Fr.	23	Th.	23	W.	23	Tu.
1873 E.	24	Tu.	24	M.	24	S.	24	Sa.	24	Fr.	24	Th.	24	W.
1874 D.	25	W.	25	Tu.	25	M.	25	S.	25	Sa.	25	Fr.	25	Th.
1875 C.	26	Th.	26	W.	26	Tu.	26	M.	26	S.	26	Sa.	26	Fr.
1876 B. A.	27	Fr.	27	Th.	27	W.	27	Tu.	27	M.	27	S.	27	Sa.
1877 G.	28	Sa.	28	Fr.	28	Th.	28	W.	28	Tu.	28	M.	28	S.
1878 F.	29	S.	29	Sa.	29	Fr.	29	Th.	29	W.	20	Tu.	29	M.
1879 E.	30	M.	30	S.	30	Sa.	30	Fr.	30	Th.	30	W.	30	Tu.
1880 D. C.	31	Tu.	31	M.	31	S.	31	Sa.	31	Fr.	31	Th.	31	W.

ERRATA.

Since the Printing of this work the following errors have been discovered which the Reader will please correct.

Page 3, line 2 from top for "*1th inch*" read "*1th foot.*"
24, line 2 from top for "*49 feet 9 inches,*" read "*49 feet 9½ inches.*"
164, line 4 from top for "*Jake,*" read "*Jute.*"
146, in Application for "*page 95,*" read "*page 206.*"
147, in table of Decimals of Feet for "8133," read "8333."
190, line 24 from top for "*page 31,*" read "*page 178.*"
235, line 2 from top for "*Tillatinum* or *Pillanium,*" read "*Titanium* or *Palladium.*"
236, line 1 for "*Plumber,*" read "*Tinmen;*" line 2 for "*Tinmen,*" read "*Plumber.*"

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